

Wright Cyclone 18 R-3350 Engine for Boeing B-29 Superfortress on Torque Stand in Engineering Laboratories of U.S. Air Technical Service Command, Wright Field, Ohio

AIRCRAFT ENGINES OF THE WORLD 1945

BY

PAUL H. WILKINSON

CONSULTING ENGINEER

Member of the Society of Automotive Engineers Member of the Institute of the Aeronautical Sciences

Author of
Diesel Aircraft Engines, 1936
Aircraft Diesels, 1940
Aircraft Engines of The World, 1941
Diesel Aviation Engines, 1942
Aircraft Engines of the World, 1944

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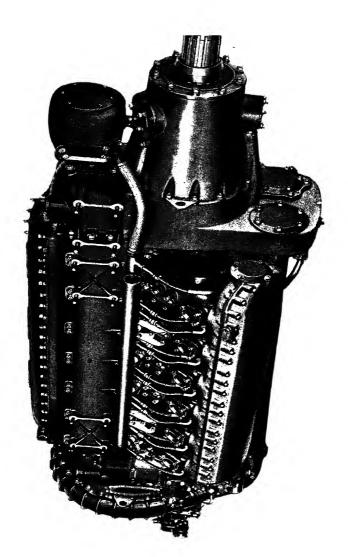
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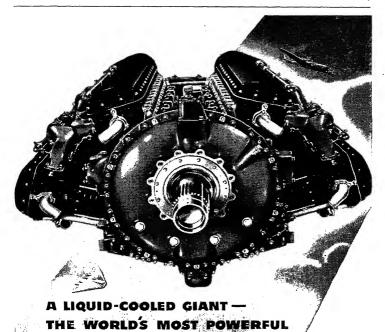
The Continental I.1430 12-Cylinder Liquid-Cooled Inverted-Vee Engine—United States of America

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Vokes Limited, England
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Going into America's new planes is the most powerful liquid-cooled aircraft engine in the world. * It is an Allison engine — of approximately 3,000 horsepower. * It is more powerful by hundreds of horsepower — gives our pilots over a third more power to work with than the huskiest engine they had before. * Virtually all its parts are the same as in other Allisons. So plane crews around the world can service it right now. * Its high power, long range, smoothness and dependability are qualities vital in the days of war, and equally important in the planes in which you will fly when peace returns.

KEEP AMERICA STRONG BUY MORE WAR BONDS

POWERED BY

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Mustang P-63—Kingcobra

The more-than-50,000 Allison engines built for the U. S. Army Air Forces power the above planes.

LIQUID-COOLED AIRCRAFT ENGINES





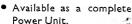
Indianapolis, Indiana

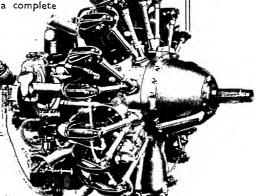
Every Sunday Afternoon
GENERAL MOTORS SYMPHONY OF THE AIR
-NBC Network

9 CYL. AIRCOOLED RADIAL ENGINE

- Fully Automatic Carburation.
- Fully Screened Ignition.
- Fitted with 0.5: I reduction gear.

• Incorporates provision for the fitting of variable pitch, full feathering propeller.





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(as type tested)

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At 3,000 R.P.M., 8,250 ft. Altitude, and + 3 lbs. per sq. in. Boost. AC 3,000 R.P.M., a 5,201 ft. Aitetude, and + 3 lbs. per sq. in. Boost.

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MAXIMUM CONTINUOUS CRUISING POWER

At 3,000 R.P.M., 9,750 ft. Altitude, and + 2 lbs. per sq. in. Boost.

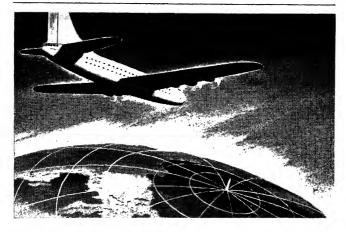
Type of Fuel-(87 Octane) D.T.D. 230 Fuel Consumption, Maximum Continuous Cruising Conditions (Pts./BHP/HR) 0:60 Type of Oil D.T.D. 109
Oil Consumption (Pts. per hr.) 3 to 7
NET DRY WEIGHT (Ibs) 708 OVERALL DIAMETER 41 inches

415 435 H.P.

430/450 H.P.

415 H.P.

COVENTRY, England.



"SO THAT'S THE NORTH POLE!"

Soon the North Pole will need a marker — adequate identification for the postwar passengers on polar routes who'll want to tell their friends they've really seen it. Meanwhile American Bosch sticks to its war jobs — starting vibrators for positive ignition at all temperatures from equator to the arctic circle — aviation magnetos that have helped modern aircraft engines maintain service ceilings of seven miles and more — gasoline injection equipment that saves fuel, steps up pay load, increases engine performance and round trip military range. Whether the future will demand more and more production for military needs or a rapid changeover to transports for polar and other global routes, in research, design and production, American Bosch will continue to serve all branches of the internal combustion industry.

American Bosch Corporation . Springfield, Mass.



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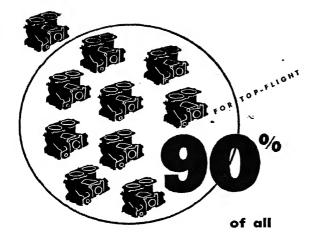
* Ceramic or mica insulated.



THE BG CORPORATION

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Contractors to the United States Army, Navy and Coast Guard and Aircraft Engine Builders



Aircraft Carburetors

built

are made by STROMBERG

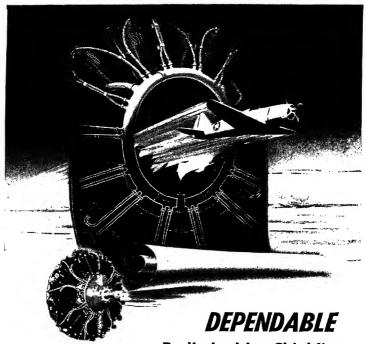
Those who are intimately acquainted with the aircraft industry know that year-after-year acceptance of a product does not come by chance or luck. The accepted product holds its place on merit alone.

Nor does success in one year guarantee success in the next. The vigilant eyes of the industry keep constant watch. The inferior product is dropped as quickly as its shortcomings are discovered. The good product yields its place to the better. In this ceaseless struggle for survival, only the best remains in use.

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For the past ten years, the aircraft industry has preferred Stromberg to all others by 8 to 1. 90% of all Aircraft Carburetors built are made by Stromberg.

Bendix PRODUCTS DIVISION Bendix Aviation Corporation, South Bend 20, Indiana



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Breeze Radio Ignition Shielding is now giving dependable service on America's fighting aircraft the world over, under the grueling conditions of wartime operation. Designed for use on hundreds of different types of engines, this shielding has been developed and perfected by Breeze over a period of many years. Such a background in the field has given Breeze

the "know-how" to design and manufacture Radio Ignition Shielding to meet any requirement. And in the world of tomorrow, Breeze experience in the engineering and production of Shielding Assemblies will be of great value in the continuing development of electronic and communications equipment for industry, transport, and the home.



CORPORATIONS, INC. Newark, N. J

PRODUCTION FOR VICTORY . PRODUCTS FOR PEACE



The name behind the world's finest aero engines.

The world's finest aero engines—this is a sweeping statement, yet when one considers the tremendous contribution made by the famous range of "Bristol" sleeve-valve engines to the war effort, such a claim is justified. To mention a few—Halifax III, Lancaster II, and the Stirling, all are powered by "Bristol" Hercules sleeve-valve engines—a record unsurpassed in the aero-engine field. Meanwhile, the performance of the Hercules in these and other British battle planes justifies the belief that the best engines of peace, too, will be based on the famous "Bristol" single sleeve-valve principle.





BACKGROUND TO ACHIEVEMENT

Hight

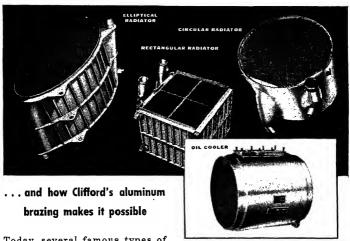
SCARCELY a British 'plane takes to the air without the assistance of BTH. From the pulsating magneto with its vital spark to the tiny Mazda lamp on the control board, BTH has contributed a generous quota to flying efficiency. Included in this electrical equipment are starters, generators, air-compressors, engine-speed indicators, under-carriage and flap-operating equipment, petrol pump motors, etc.

BTH research has contributed much to the efficiency of the air-arm in combat and defence, and especially in the development of Air Commodore Whittle's jet engine, work on which was commenced in the BTH Rugby Factory as early as 1936. The first successful flight of an aeroplane fitted with this engine was in May 1941.

BTH

IA104

HOW THIN ALUMINUM TUBING IMPROVES HEAT TRANSFER UNITS



Today, several famous types of planes of the USAAF are flying higher, farther and faster because of the Clifford Feather-Weight Oil Cooler and Coolant Radiators pictured on this page. Their all-aluminum structure saves 3/4 the weight of their copper predecessors and throws in longer life as an extra dividend.

When heat transfer units call for lighter weight and more "guts", men who know specify Hydron seamless aluminum tubing . . . bonded inti-

mately to header plates... by allaluminum alloy...brazed by Clfford's exclusive patented method.

For, Clifford Feather-Weight Heat Transfer Units provide, for the first time, greater resistance to temperature, pressure and vibration in elliptical and oblong designs as well as in conventional circular cross-sec-



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CLIFFORD

First with the Facts on
HYDRON

ALUMINUM BRAZING
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 BELLOWS





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Here are two books designed to help users of Molybdenum steels and irons to conserve all alloying elements, and possibly steel and iron, by getting the most in the way of strength, toughness and wear resistance with the lowest alloy content.

"MOLYBDENUM IN STEEL" covers the fundamental metallurgy of Molybdenum steels. Heat treatment—physical properties—applications—of a number of these steels are treated at length.

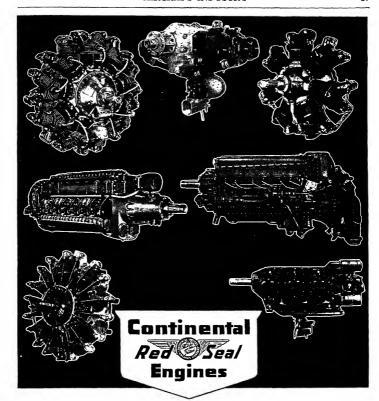
"MOLYBDENUM IN CAST IRON" covers the effect of Molybdenum in gray iron, giving suggested analyses for practical applications and detailed discussion of high strength (60,000 p.s.i. and up) irons.

Both books will gladly be sent without charge on request.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.







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The complexity of these aircraft engines built by Continental shows an extraordinary ability to produce.

Each model of engine enjoys the advantages of the most modern and efficient equipment for the development of operating characteristics and to prove endurance qualities.

All parts are coordinated to insure the utmost in power, economy, smooth operation and dependability. The final result is called Continental Red Seal Power — the Power to Win.

Your Dollars Are Power, Tool Buy War Bonds and Keep Themi

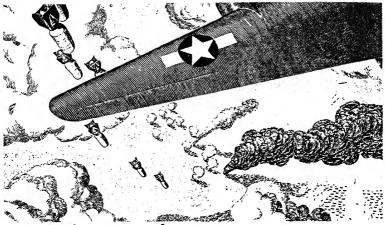


Awarded to the Detroit and Muskegon Plants of Continental Meters Corperation For High Achievement

<u>Continental Motors Corporation</u>

Aircraft Engine Division

MUSKEGON, MICHIGAN



Turning Point

• Shortly after the first world war, Eaton engineers were working feverishly with a hollow, self-cooling valve that would permit airplane engines to cover long distances at high speed without overheating.

Progress was made—and much was learned during those trying days. And the work continued, in conjunction with aircraft engineers.

The famous Sodium-Cooled Valve was the result. It marked the turning point in aviation history.

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Eaton considers it a great privilege, as well as a great responsibility, to be so closely associated with the great new American industry that is destined to change the history of the world.



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PLANTS: CLEVELAND • DETROIT • SAGINAW MARSHALL • BATTLE CREEK • VASSAR • MASSILLON



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- # ENGINE STARTING SYSTEMS
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- * SUCTION & AIR PRESSURE SYSTEMS
- ★ ENGINE & PROPELLER CONTROL SYSTEMS
- ★ ICE ELIMINATION SYSTEMS
- * SERVO CONTROL SYSTEMS
- + HYDRAULIC EQUIPMENT
- * MISCELLANEOUS ELECTRICAL & MECHANICAL COMPONENTS



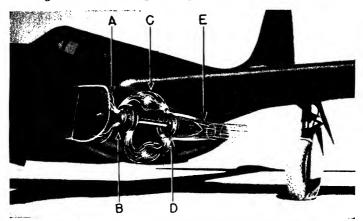


ECLIPSE-PIONEER DIVISION

BENDIX AVIATION CORPORATION, Teterboro, N. J.

G-E JET-PROPULSION ENGINES

Lightning-swift speed and other vitally important advances in performance characteristics have been achieved by propellerless planes powered by the new-type jet engine of revolutionary design which was developed and produced by General Electric.



OPERATION: A. Air flows into intake: B. Air is compressed: C. Compressed air goes to blast chamber, where fuel is ignited and temperature raised; D. Turbine is propelled by gas pressure,

and it in turn gives power to air compressor at front of engine; E. Nozzle through which air flows at high velocity, creating, by reaction, the force which drives the plane forward.

SOME OF MANY OTHER G-E AIRCRAFT PRODUCTS

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Aircraft lamps Amplidynes

Armament equipment Automatic pilots

D-c generators

Electric control devices Electric motors

Electric heating devices lanition systems

Radio receivers Radio transmitters

Selsyn-operated control systems

Turbosuperchargers

No matter where you are located, there is a G-E representative near you—he'll be glad to serve you in any way he can. General Electric Company, Schenectady 5, New York.







This Jacobs engine is no war baby, hot-house developed at high speed, with cost no object . . . no military matériel headed for future scrap heaps when the show is over!

The Jacobs was born in the twenties, built for pilots who paid for their own engines out of perilous prize money and hard-earned charter hours...developed through the Depression years when aviation was in the poorhouse...a bread and butter job for ships that had no spares...an orphan child on upkeep, but a hog for performance and payload.

When the war broke, the Jacobs was a sure thing in its power class, proven in performance, ripe for

quantity production, and

ready for the tough job of toting twinengine trainers that turn hot pilots into Big Operators.

Jacobs engines take more take-offs and more full throttle time than the big radials on combat ships, stand up under student handling, diverse terrain and varied climate... and today deliver more than a thousand hours of service between major overhauls—performance that is three times the original prescription!

For worry-free, dependable delivery of packaged power at low cost, Jacobs had a lot to offer the war effort . . . will have even more for peacetime aviation and industry. Proof on request . . . Jacobs Aircraft Engine Co., Pottstown, Pa.

JACOBS · Pottstown, Pa.



THE majority of those who use and respect Kollsman aircraft instruments know them most intimately as sentinels on the airplan instrument panel, indispensable to the plane's precise and dependable operation.

But long before our war-birds ever get into service, many engineers certify their design and performance with Kollsman instruments in wind tunnels, engine test cells and in test flights.

Because of their accuracy, standard Kollsman instruments are found in frequent use for many forms of aeronautical experiment and in production testing. In addition, many special Kollsman instruments have been developed for these uses.

KOLLSMAN AIRCRAFT INSTRUMENTS



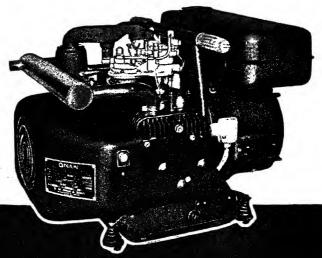
Electricity AVIATION APPLICATIONS

ONAN ELECTRIC GENERATING PLANTS provide reliable, economical electric power for many applications in the aviation industry. Available in 65 models including Airborne types. Powered by Onan-built, 4-cycle, gasoline engines, these electric plants are of compact, single-unit design. Built tor heavy duty or intermittent service, stationary or mobile. Supply power for starter energizing . . . radio navigation . . . battery charging . . . communications . . . cabin heating . . . airport and general lighting . . . electrical repair tools . . . aircraft accessories . . . many other applications.

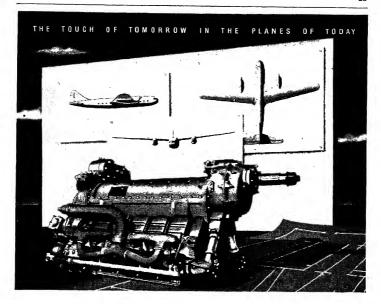
350 to 35,000 WATTS



Sizes range from 350 to 35,000 watts. A.C. types of 115 to 660 volts; 50, 60, 180 cycles, single or three phase, and 400, 500 and 800 cycles, single phase; also special frequencies. D.C. types range from 6 to 4,000 volts. Dual voltage types available . . . Write for descriptive literature . . . Model shown is from OTC series.



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INLINE FOR THE AIRLINES

Here in this clean, compact package is power for the airplanes of tomorrow airplanes that will knit together the world's growing network of airways.

Latest in production of a long line of Ranger engines, the Ranger Twelve is ready to take its place as the efficient power plant for feeder line transports of the new air age.

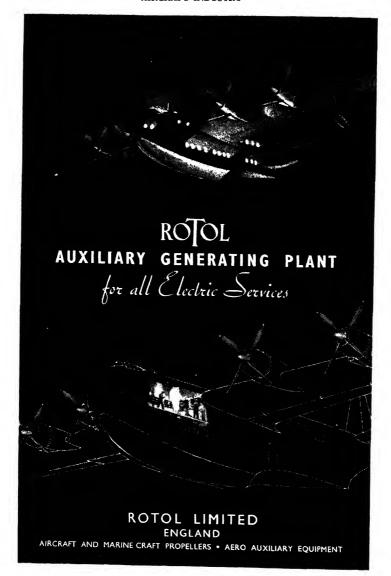
Constantly improved since its inception, Ranger Twelve is backed by fifteen years of Fairchild experience in building aircraft engines. Its dependability is assured by Fairchild precision construction

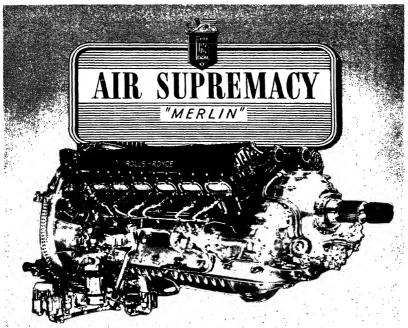
and a heritage of careful research and engineering skill.

Inline, aircooled, inverted; one of the few truly highspeed aircraft engines in existence, the Ranger Twelve delivers smooth power. The simplicity of its design can sharply reduce inspection and maintenance expense.

Within its design, too, lies a promise ... a promise for even greater efficiency and sleekness in new Rangers to come through that quality built into all Fairchild products, "the touch of tomorrow in the planes of today."

Division of Fairchild Engine and Airplane Corporation • Farming dale, Long Island





The air supremacy of the Allies is one of the major factors contributing to ultimate victory.

In this air supremacy must be recognised the vital contribution

In this air supremacy must be recognised the vital contribution made throughout the war by operational aircraft powered with Rolls-Royce engines.

HENLEY	MOSQUITO	BATTLE		
WHITLEY	HURRICANE	SPITFIRE		
DEFIANT	WELLINGTON	FULMAR		
HALIFAX	BEAUFIGHTER	LANCASTER		
SEAFIRE	BARRACUDA	MUSTANG		



EAERO ENGINES



Engines roaring, an American Bomber stands poised on her runway . . . literally "coiled to strike" at the enemy. For the steady beat of her mighty engines depends on this coil . . . the coil of a Bendix-Scintilla* Aircraft Magneto. In this one vital part . . . precisely designed, tested and retested . . thousands of careful turns of fine wire step up voltage from 18 to 18,000 . . . produce, with unfailing dependability, powerful, precisely timed sparks for engine ignition.

Bendix-Scintilla is proud of the

many contributions its engineers have made to the advancement of aircraft ignition . . . contributions destined to play as vital a role on the sky transports of tomorrow as they do in the battle planes of today.

THE WORLD'S FINEST AIRCRAFT IGNITION



Bendix-Scintilla Aircraft Magnelos, Harnesses and Switches, vital members of "The Invisible Crew," are standard equipment for the major aircraft engine manufacturers, including:

Allison • Jacobs • Continental • Lycoming • Lawrance • Wright Aero Corp. • Pratt & Whitney • Warner • Packard • Ranger • Ford • Nash • Chrysler • Kinner.

SCINTILLA MAGNETO DIVISION

SIDNEY, NEW YORK



*TRADE-MARK OF BENDIX AVIATION CORPORATION

Horizons widen through SHELL RESEARCH



FINER FUELS FOR THE AGE OF FLIGHT

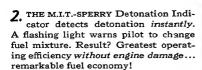
New Flight Instrument guards against fuel waste!

ECONOMY

M.I.T.-Sperry Detonation Indicator Insures Fuel Economy . . . Longer Engine Life . . . Greater Safety



1. THE ENGINES on this airplane may be detonating, but the pilot has no way of knowing. Detonation increases internal pressure and temperature tremendously. If continued, it damages engines, may cause failure.





3. PRELIMINARY TESTS show savings in fuel of 10% or more over typical airline practice. Payload can be added. Safety is increased, engine life prolonged, and periods between engine overhaul lengthened.

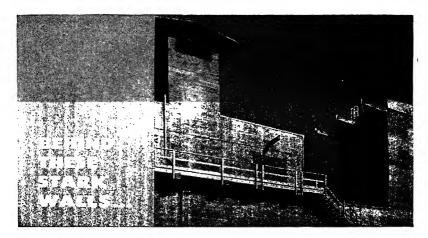
Detonation Indicator is installed ex-

ternally—no piercing of cylinders. It is designed for use on all types of engines and aircraft. Where fuel economy is important—as it will be in postwar commercial aviation—this new flight instrument will stand continuous guard against wasteful conditions.

Sperry Gyroscope Company

Great Neck, New York • Division of Sperry Corporation

GYROSCOPICS : ELECTRONICS . AUTOMATIC GOMPUTATION . SERVO-MECHANISMS



The new limits of new Aviation Fuels will be explored in the Petroleum Industry's First full scale Engine Testing Laboratory

Even against the weird landscape of a modern refinery, it is an architectural oddity, a windowless dwarf of a building, a runt in comparison with its towering neighbor the "Cat Cracker."

But it wasn't to win architectural awards that this squat concrete cell was built and stoutly anchored on a 9-foot thick bed of concrete.

This is an aircraft engine testing laboratory unlike any other in America. Here engines will be run to the death not to test the engine but the fuel.

It will handle anything up to 3,000 horsepower. And throughout, from its vibration-proof control room floated on cork to its 50,000 cubic feet per minute exhaust fan, its equipment is the last word.

Controls are electronic, tempered air for carburetion will be supplied at 4" mercury pressure. Instead of the normal 4 checks on temperatures within an engine... there will be 186 thermo-couples. We'll get fractional horsepower ratings. We'll run engines far above their rated power to test the limits of the new fuels that come from our laboratories.

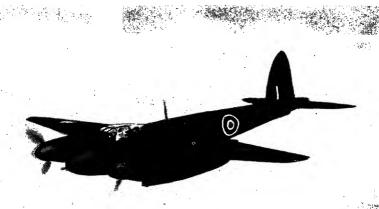
It is the first full-scale engine testing cell in the petroleum industry. It will enable us to set up the first uniform testing method to get fuel ratings and full-scale data.

And it will be bound to increase the contributions we make to the science of aviation fuels.

YOU CAN DEPEND ON







MOSQUITO NIGHT FIGHTER (courtesy de Havilland Aixcraft

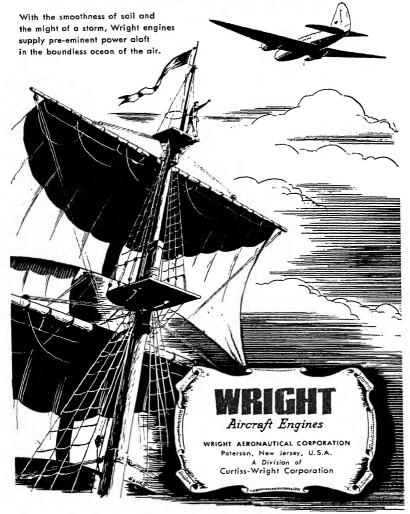
ONE OF THE MANY

The de Havilland Mosquito, one of more than fifty types of aircraft—British and American—roaring into battle equipped with Vokes Filters. Eighty-seven types have been so equipped since the war began. Filters applied include dry and oil-wetted air cleaners with housings and induction systems; lubricating oil and fuel filters; filters for hydraulic undercarriages and gun-turrets; Test Bed Filters and mobile oil filters; and filters for radio receiving and transmitting sets, blind flying instruments, and a host of other purposes. Large and small, all have an efficiency rating of 99.9 per cent., and all are the products of a quarter of a century's specialised manufacturing experiences.

Contractors to British and Dominion Governments

VOKES LTD., LONDON. S.W. PIONEERS OF SCIENTIFIC FILTRATION

POWER ALOFT



CYCLONES AND WHIRLWINDS PAY THEIR WAY

PREFACE

AIRCRAFT ENGINES OF THE WORLD, 1945 edition, is the third volume of this international reference book. It contains complete data on all the latest aircraft engines of the United States, Great Britain, Australia, France, Germany, Italy, Japan and the U.S.S.R. It also includes jet propulsion engines and airborne auxiliary power plants. The contents have been revised as of January, 1945, and much of the material is exclusive.

Statistically, the 1945 edition of the book contains 352 pages compared with 320 pages for 1944. This increase has been made necessary to provide space for important new features. The standardized engine data section comprises 122 aircraft engines with full page photographs. Of this total, 37 data pages and 56 photographs are new, and 38 data pages contain major revisions. Approximately 60 per cent of the data pages and 45 per cent of the photographs in the standardized engine data section have been changed for 1945, apart from the additional features which have been added.

Jet propulsion has a special section devoted to it in the 1945 edition. In it will be found typical jet engines and gas turbines of American, British and German manufacture. The difference between the various kinds of jet engines is given in simple terms, and their cyclic functioning is explained. Photographs, sectional views and cut-away drawings are used to illustrate these new power plants.

Japanese aircraft engines—both air-cooled and liquid-cooled—are now featured in this new edition. This information is of vital interest in view of the growing importance of the Pacific as a theater of war. Data is given on all of the latest Japanese engines, and three of them are illustrated and described in complete detail. This material is the most up-to-date that has ever been published, here or abroad.

New United States aircraft engines described in *complete* detail and illustrated with full-page photographs, include the Allison V-1710-E11 (2-stage), V-1710-F30 (turbo) and V-3420-A16 (turbo); the Continental C-140-1; the Franklin 6ACV-298 and 6ACV-403 helicopter engines; the General Motors Research X-250-D (2-cycle); the Lycoming O-435-D helicopter engine; the Packard V-1650-3 (2-stage) and V-1650-7 (2-stage); the Pratt & Whitney Twin Wasp R-1830 SSC7-G (2-stage), Twin Wasp R-2000 2SD-G, and Double Wasp R-2800 2SB-G (1-stage) and R-2800 SSB2-G (2-stage); the Ranger SGV-770D-5; the Warner Super Scarab 185; the White R-275S; and the Wright Cyclone 7 R-1300 C7BA, Cyclone 9 R-1820 C9HC, Cyclone 14 R-2600 C14BB and Cyclone 18 R-3350 C18BA.

36 PREFACE

New foreign aircraft engines described in complete detail and illustrated with full-page photographs, include the British Bristol Mercury XV, Pegasus XVIII, Taurus XII and Hercules XVI (all 100/130 grade); the Cirrus Minor (Series II); the Napier Sabre IIA; and the Rolls-Royce Merlin 63 (2-stage), Griffon IV (1-stage) and Griffon 65 (2-stage); the Australian Commonwealth Aircraft R-1340 and R-1830, and General Motors-Holdens Gipsy Major; the German Daimler-Benz DB 603 and DB 605, and Junkers Jumo 206 (Diesel) and Jumo 213; and the liquid-cooled Japanese Aichi Atsuta. The new British Rotol P-6 airborne auxiliary power plant is also included.

In addition to complete data on the afore-mentioned engines, there is also considerable data on important new engines such as the United States Continental I-1430 and Pratt & Whitney Wasp R-2800 (C-series); the British Bristol Centaurus, Bristol Hercules XVII and XVIII, Napier IIB, and Rolls-Royce Merlin, 32, 72 and 73; the German Argus As 411, B.M.W. 802, Daimler-Benz DB 606 and DB 610, and Junkers Jumo 208 (Diesel); the Japanese Kawasaki Type 2, Mitsubishi Kasei and Nakajima Homare; the U.S.S.R. M-82 and M-107; and many other Japanese and Soviet engines.

The author of this book is an American-born citizen who has been connected with aviation since 1914. In England, he served his apprenticeship with the British Thomson-Houston Company Ltd. During World War I, he was with A. V. Roe & Company Ltd., and the Royal Aircraft Establishment. In the United States he has been with the Boeing Aircraft Company and the Douglas Aircraft Company. During World War II, his aviation activities have been with the War Production Board, the Board of Economic Warfare and the War Manpower Commission of the United States Government.

Other aviation books by the author include Diesel Aircrast Engines (1936), Aircrast Diesels (1940), Aircrast Engines of the World (1941), Diesel Aviation Engines (1942), and Aircrast Engines of the World, (1944).

January, 1945

Paul H. Wilkinson

INTRODUCTION

Progress made with aircraft engines during the past year shows that a steady gain in power output and efficiency has been obtained by refinements in design as well as by the development of new types of engines. Improved cooling has played an important part and better carburation has been a contributing factor. Higher grade fuels have enabled higher boost pressures to be used resulting in increased brake mean effective pressures and increased power outputs. Recent progress made with high-powered air-cooled engines and liquid-cooled engines is shown in the following tabulation.

HIGH-POWERED AIRCRAFT ENGINES, 1944-1945

Engine		Max.	Dis- placement		Maximum h.p. per			Maximum b.m.e.p.	
Make	Model	h.p.	cu.in.	liters	cu.in.	liter	cyl.	lb./ sq.in.	kg/ cm²
AIR-COOLED ENGINES (RADIAL)									
Pratt & Whitney Wright Wright Bristol Bristol Gnome-Rhone B.M.W. Piaggio Mitsubishi Nakajima	R-2800 R-2600 R-3350 Hercules Centaurus 14R 801 P. XII Kasei Homare	2,200 1,675 2,000 1,660 1,700 1,500 1,800	2,603 3,347 2,360 3,270 2,360 2,550 3,234 2,570 2,185	42,7 54,9 38,7 53,6 38,7 41,8 53,0 42,1 35,8	0.71 0.73 0.66 0.71 0.61 0.70 0.67 0.49 0.70 0.82	43,6 44,5 40,1 43,3 37,3 42,9 40,6 28,3 42,7 50,3	117 136 122 120 117 118 121 83 129 100	208 206 187 194 - 213 196 175 -	14,6 14,5 13,1 13,6 - 15,0 13,8 12,3 -
	LIQUID-C	OOLEI) ENG	INES	(IN-LI	NE)			
Allison Allison Continental Napier Rolls-Royce Rolls-Royce Daimler-Benz Daimler-Benz Junkers U.S.S.R.	V-1710 V-3420 I-1430 Sabre Merlin Griffon DB 603 DB 605 Jumo 213 AM-38	2,600 2,100 2,200 1,650 2,000 1,800 1,500 1,700	1,710 3,420 1,425 2,240 1,649 2,240 2,720 2,180 2,250 2,800	56,0 23,3 36,7 27,0 36,7 44,5 35,7 36,9	0.86 0.76 1.47 0.98 1.00 0.89 0.66 0.69 0.76	52,7 46,4 90,1 60,0 61,1 54,5 40,5 42,0 46,1 34,9	123 108 175 92 137 166 150 125 142 133	227 201 342 210 264 256 194 202 223 201	16,0 14,1 24,0 14,7 18,6 18,0 13,6 14,2 15,7

The figures in the above tabulation are based on the military ratings of the engines in all instances. Particular attention is called to the figures for the latest German and Japanese engines.

73 octane 80 octane

87 octane

91/96 grade

100/130 grade

Five grades of aviation gasoline are now available for American and British aircraft engines, as shown in the following tabulation.

Gasoline Grade	U.S.A. Specification	British Specification	Used in
73 octane	AN-F-23	RDE/F/73 OS	Small engines

D.T.D. 230

D.E.D. 2474

D.E.D. 2475

Small engines

Medium engines

Military engines

Airline engines

None

AVIATION GASOLINE, 1944-1945

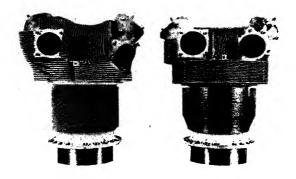
AN-F-24

AN-F-25

AN-F-26

AN-F-28

Other countries use aviation gasoline of lower grades. Germany uses 92-octane gasoline of high aromatic content in its high-powered engines, but direct fuel injection compensates to some extent for this deficiency. Japan also uses 92-octane gasoline. In the U.S.S.R., 95-octane gasoline is standard in military aircraft engines.



OLD AND NEW STYLE CYLINDERS-WRIGHT

UNITED STATES OF AMERICA

The United States of America has many achievements to its credit in the aircraft engine field. Wright is now producing the most powerful air-cooled engine in the world with a rating of 2,200 h.p. New W-type aluminum alloy fins permanently secured to the cylinder barrels, and forged aluminum alloy cylinder heads permitting machined finning, are helping to increase the performance of Wright engines. Pratt & Whitney is manufacturing an air-cooled engine rated at 2,100 h.p. equipped with a 2-stage supercharger. A water injection device developed by Pratt & Whitney enables increased bursts of power to be obtained momentarily from its engines in combat.

In the liquid-cooled engine field, Allison is now manufacturing a high-altitude engine rated at 1,325 h.p. equipped with a 2-stage supercharger, and it is also producing the most powerful liquid-cooled engine in the world with a rating of 2,600 h.p. Packard is continuing to do a good production job with the 2-stage Rolls-Royce Merlin rated at approximately 1,600 h.p., and Continental has now undertaken the manufacture of this 2-stage British engine.

With regard to medium-powered engines, Ranger has an improved version of its air-cooled inverted vee-type engine in production equipped with its new Al-Fin (integrally bonded steel and aluminum alloy) cylinders. Jacobs is continuing to manufacture its well-tried air-cooled radials in addition to building Pratt & Whitney Wasp Junior and Wasp engines.

In the low-powered field, Continental has brought out a new series of 6-cylinder horizontally-opposed air-cooled engines suitable for postwar aircraft. Franklin helicopter engines have been augmented by a more powerful air-cooled power plant which is now being used in military aircraft. General Motors (Research Laboratories) has developed an 8-cylinder X-type liquid-cooled 2-cycle engine for small aircraft. Lycoming has added a 6-cylinder helicopter engine to its line of horizontally-opposed air-cooled power plants. Warner has brought out a new 7-cylinder air-cooled radial for post-war use. White has a small 5-cylinder air-cooled radial ready for production.

Firms in the automotive field such as Buick, Chevrolet, Chrysler (Dodge), Ford, Nash and Studebaker are continuing to produce large quantities of high-powered air-cooled engines of Pratt & Whitney and Wright designs.

In the Diesel field, Guiberson is proceeding with the development of air-cooled 4-cycle engines for post-war aircraft.

Jet propulsion engines are now being manufactured by General Electric. Allison has recently undertaken to augment the production of G-E jet engines for military aircraft.

Airborne auxiliary power plants with small gasoline engines driving electric generators are being produced by Andover, Eclipse, Lawrance and Onan for military and civil needs.

In the aircraft engine equipment field, new devices have been developed and improvements to existing equipment have been made. General Electric turbo-superchargers are being produced in large quantities and they are now standard equipment for the engines in many of our latest combat planes. Bendix Aviation is making a big contribution with its Eclipse direct cranking and inertia electric starters capable of starting engines of more than 3,000 h.p.; with its Scintilla magnetos some of which are now supercharged for use in the sub-stratosphere; and with its Stromberg injection-type carburetors which pressureatomize the fuel and function automatically at all altitudes.

¹ See Jet Propulsion section of this book, pages 336 to 341 inclusive.

American Bosch is manufacturing starting vibrators, magnetos and gasoline injection pumps. BG spark plugs of both mica and ceramic types are being produced in large quantities for the engines of the Allied nations. Breeze shielded ignition harness and cartridge-type starters are establishing a fine reputation for reliability, here and abroad.

Kollsman is now manufacturing a new horsepower indicator which shows both brake mean effective pressure and net horsepower output, and a new type of synchroscope for use with its electric tachometer. Sperry has developed the MI.T.-Sperry detonation indicator which detects pre-ignition in an engine, and an automatic mixture control for use with it which automatically corrects the fuel mixture. Other important developments include Eaton sodium-cooled valves which have done much to make high-powered engines possible; new fuel transfer-pumps and booster pumps of high efficiency manufactured by Thompson Products; lightweight aluminum alloy oil coolers and coolant radiators pioneered by Clifford; and Molybdenum alloy steels for highly stressed parts such as crankshafts and connecting rods developed by Climax Molybdenum.

Shell and Standard of New Jersey have continued their research for finer fuels and lubricants, and better manufacturing methods. Standard recently opened a full-scale testing laboratory for aircraft engines up to 3,000 h.p. Shell has made similar progress in laboratory engine test equipment.

AIRCRAFT ENGINES

Allison Division of General Motors Corporation builds 12-cylinder and 24-cylinder in-line vee-type liquid-cooled power plants. Current production models of the 12-cylinder engine are the V-1710-E series characterized by a separate reduction gear box with a hollow propeller shaft for a cannon mounted approximately 8 feet (2,4 meters) ahead of the engine where it is driven by means of a 2-piece extension drive shaft; and the V-1710-F series characterized by a short nose reduction gear box attached directly to the front of the engine crankcase. All V-1710 engines are equipped with a gear-driven 1-speed supercharger integral with the engine.

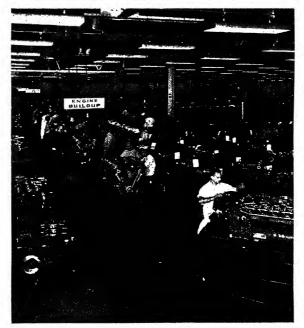
The Allison V-1710-E19 (-85) engine has a 1-speed supercharger and it is rated at 1,200 h.p. at take-off with a military rating of 1,125 h.p. at 15,500 ft. (4 700 m).

The Allison V-1710-E11 (-93) is a more recent engine which, in addition to its 1-speed supercharger, has a variable-speed auxiliary stage supercharger at the rear of the engine driven by an extension shalt and controlled by a hydraulic coupling. It is rated at 1,325 h.p. at take-off with a military rating of 1,150 h.p. at 22,400 ft. (6 300 m).

The Allison V-1710-F17R (-89) and -F17L (-91) engines are similar in design to the 1-stage V-1710-E series engines, except for the extension drive shaft. In addition to their gear-driven 1-speed super-

chargers, however, they are equipped with General Electric turbosuperchargers. They are rated at 1,425 h.p. at take-off with a military rating of 1,425 h.p. at 27,000 ft. (8 200 m).

The Allison V-1710-F30R (-111) and -F30L (-113) engines are still more recent power plants which have special supercharged ignition systems enabling them to function at very high altitudes. They are rated at 1,475 h.p. at take-off with a military rating of 1,475 h.p. at 30,000 ft. (9 100 m), with General Electric turbo-superchargers.



ALLISON ASSEMBLY LINE-UNITED STATES

The Allison V-3420-A16R (-11) and -A16L (-13) engines are 24-cylinder double vee-type versions of the V-1710. They have four cylinder blocks mounted on a common crankcase and two crankshafts geared to a common propeller shaft. They are equipped with geardriven 1-speed superchargers and General Electric turbo-superchargers which maintain their take-off rating of 2,600 h.p. to an altitude of 25,000 ft. (7 600 m).

Allison Division, in addition to building aircraft engines of the reciprocating type, has recently undertaken the manufacture of General Electric jet propulsion engines.

Buick Motor Division (Aviation Engine Division) of General Motors Corporation is building 14-cylinder air-cooled radial engines of Pratt & Whitney design. These engines include the Twin Wasp R-1830 (C series) S3C4-G and the Twin Wasp R-2000 (D series) 2SD1-G.

Chevrolet Motor Division (Aviation Engine Division) of General Motors Corporation has been manufacturing Pratt & Whitney Twin Wasp R-1830 (C series) S3C3-G and S3C4-G 14-cylinder air-cooled radial engines, and it is now producing Double Wasp R-2800 (C series) 18-cylinder radials.



CHEVROLET CONVEYOR LINE-UNITED STATES

Continental Aviation & Engineering Corporation, a subsidiary of Continental Motors Corporation, is building 12-cylinder vee-type liquid-cooled engines similar to the Packard V-1650-7 2-stage engine of British Rolls-Royce Merlin design. It is also building a 12-cylinder liquid-cooled inverted-vee engine of its own design known as the Continental I-1430 which has a maximum output of 2,100 h.p. with a turbo-supercharger.

Continental Motors Corporation builds horizontally-opposed and radial air-cooled engines none of which are supercharged. The horizontally-opposed 4-cylinder engines of the A series are the 50 h.p. A-50, the 65 h.p. A-65, the 75 h.p. A-75 and the 80 h.p. A-80.

The Continental C-75-12 of the new C series is a horizontally-opposed 4-cylinder engine which is rated at 75 h.p. The C-85-12 engine of this series develops 85 h.p.

The Continental C-140-1 is the most powerful model of a new series of 6-cylinder horizontally-opposed engines which have the same bore

and stroke as the C series engines previously mentioned. This series includes two direct-drive engines—the 115 h.p. C-115-1 and the 125 h.p. C-125-1—and the geared-drive C-140-1 rated at 140 h.p.

The Continental W-670 is a 7-cylinder radial which has been produced in a variety of models. The W-670-M is a recent engine which is rated at 240 h.p.

Dodge-Chicago Plant, Division of the Chrysler Corporation, is building 18-cylinder air-cooled radials of Wright design. The engine now in production is the Cyclone 18 R-3350 (B series) 670C18BA.

Ford Motor Company (Aircraft Engine Division) is now producing 18-cylinder air-cooled Pratt & Whitney Double Wasp R-2800 (B series) 2SB-G radial engines.

Franklin engines built by the Aircooled Motors Corporation are of the horizontally-opposed air-cooled type. None of them are supercharged. The smallest engine is the 4-cylinder 4AC-176 which is rated at 65 h.p.

The Franklin 6AC-298 is a 6-cylinder engine with a slightly larger bore than the 4AC-176. The geared-drive 6ACG-298-H3 model is rated at 160 h.p.

The Franklin 6ACV-298 is similar to other 6AC series engines in general design, but it is constructed for mounting with its crankshaft in a vertical position so that it can be used in helicopters. Cooling is provided by a fan above the engine which circulates air through an enclosure around the unit. This engine has direct drive and it is rated at 160 h.p.

The Franklin 6ACV-403 is a 6-cylinder engine of a new series with a larger bore and stroke than previous models. It is designed for vertical installation in helicopters and it is rated at 245 h.p., with 190 h.p. available for cruising.

General Electric Company (Aviation Division) builds jet propul-

sion engines similar to the Whittle jet engine in England.

General Motors Corporation (Research Laboratories Division) has developed a 2-cycle liquid-cooled engine for use in small aircraft. The X-250-D, as this experimental X-type engine is called, has four cylinder blocks each containing two bores with a common combustion chamber, and a 2-throw crankshaft with slipper-type connecting rods. Piston-controlled ports are used for intake and exhaust and a blower is provided for scavenging. The engine is rated at 200 h.p. and it has been test flown.

Guiberson Diesel Engine Company builds air-cooled Diesel engines of 4-cycle design. The 9-cylinder radial A-1020 engine is not supercharged and it is rated at 310 h.p. It is equipped with direct fuel injection. It has been flown in civil aircraft and a similar engine known as the T-1020 is used in Army tanks and for amphibious operations. Development work is proceeding on larger Diesel engines equipped with superchargers.

¹ See Jet Propulsion section of this book, pages 342 to 347 inclusive.

Jacobs Aircraft Engine Company builds 7-cylinder air-cooled radial engines of its own design none of which are supercharged. The Jacobs R-755 engine has the smallest displacement, and the R-755A1 (L-4MB) model is rated at 245 h.p. at take-off. The L-4MA7 model of this series with the same rating has an additional power take-off which can be used for accelerating the rotor of an autogiro before leaving the ground. Improved models of this series with increased power are being developed for post-war use.

The Jacobs R-915 engine is similar to the R-755, but it has a slightly larger bore and stroke. The R-915A1 (L-6MB) model is rated at 330 h.p. at take-off. The R-915A4 (L-6MBA) and L-6MA models with the same rating have an additional power take-off of high torque capacity making them suitable for use in jump take-off autogiros.

Jacobs also manufactures Pratt & Whitney Wasp Junior R-985 and Wasp R-1340 engines under license.

Kinner Motors Incorporated builds 5-cylinder air-cooled radial engines none of which are supercharged. The smallest one is the K-5 which is rated at 100 h.p.

The Kinner B-5 engine is similar to the K-5, but it has a larger bore and a higher compression ratio. It is rated at 125 h.p.

The Kinner R-5 engine is similar to the B-5, but it has a slightly larger bore and stroke and a higher compression ratio. The R-55 model of this series is rated at 160 h.p.

Lycoming Division of The Aviation Corporation builds horizontallyopposed and radial air-cooled engines none of which are supercharged. The smallest opposed-cylinder engine is the 4-cylinder O-145. The GO-145 geared model of this series is rated at 75 h.p.

The Lycoming O-235 is a 4-cylinder opposed engine of slightly larger bore and stroke than the O-145. It is rated at 100 h.p. There is also a 6-cylinder version of the O-235 known as the O-350 which is rated at 150 h.p.

The Lycoming O-290 is a 4-cylinder opposed engine similar to the O-235, but with a slightly larger bore. It is rated at 130 h.p. at take-off.

The Lycoming O-435 engine is a 6-cylinder version of the O-290. The direct-drive O-435-C is rated at 185 h.p., and the geared-drive GO-435-B is rated at 220 h.p.

The Lycoming O-435-D engine is a new model of the O-435 series which is designed for vertical installation in helicopters. It is a direct drive engine and it is provided with a special fan for cooling purposes. It is rated at 212 h.p.

The Lycoming R-680 engine is a 9-cylinder radial of conventional design which is equipped with a ground blower. The R-680-E3 model is rated at 300 h.p. at take-off.

Nash Kelvinator Corporation (Aircraft Engine Division) is building 18-cylinder air-cooled Pratt & Whitney Double Wasp R-2800 (B series) SSB-2-G radial engines.

Packard Motor Car Company (Aircraft Engine Division) builds 12-cylinder vee-type liquid-cooled engines of Rolls-Royce Merlin design. The engines built for the U.S. Army Air Forces are known as the V-1650 series, and those built for the British have Merlin serial numbers.

The Packard V-1650-1 engine is similar to the British Merlin XX. It has a 2-speed 1-stage supercharger and it is rated at 1,300 h.p. at take-off with a military rating of 1,120 h.p. at 18,500 ft. (5 600 m).

The Packard V-1650-3 engine is similar to the British Merlin 61. It is equipped with a 2-speed 2-stage supercharger and a liquid-cooled aftercooler. It is rated at 1,380 h.p. at take-off with a military rating of 1,210 h.p. at 25,800 ft. (7 900 m).



PACKARD FINAL ASSEMBLY LINES-UNITED STATES

The Packard V-1650-7 engine is a more powerful version of the V-1650-3. It has a 2-speed 2-stage supercharger and it is rated at 1,490 h.p. at take-off with a military rating of 1,370 h.p. at 21,400 ft. (6 500 m).

The Packard-built Merlin 28, 29, 31, 33 and 38 engines manufactured for the British are similar to the British Merlin XX. They are equipped with 2-speed 1-stage superchargers and they are rated at 1,300 h.p. at take-off with a military rating of 1,120 h.p. at 18,500 ft. (5 600 m).

Pratt & Whitney Aircraft, Division of United Aircraft Corporation, builds air-cooled radial engines all of which are supercharged. The smallest one is the 9-cylinder Wasp Junior R-985. The SB3 model of this engine is rated at 450 h.p. at take-off with a military rating of

450 h.p. at 3,500 ft. (1 100 m). The T1B3 model of the series which has the same take-off rating, can be adapted for use in helicopters. The Wasp Junior is no longer manufactured by Pratt & Whitney, but it is built under license by the Jacobs Aircraft Engine Company.

The Pratt & Whitney Wasp R-1340 is a 9-cylinder radial of considerably larger displacement than the Wasp Junior. The S3H1-G geared model is rated at 600 h.p. at take-off with a military rating of 600 h.p. at 3,000 ft. (900 m). The S1H1 direct-drive engine of the series is manufactured under license by the Commonwealth Aircraft Corporation Pty. Ltd. in Australia. Pratt & Whitney no longer builds the Wasp, but it is still produced in the United States by the Jacobs Aircraft Engine Company.



PRATT & WHITNEY PACKING ROOM-UNITED STATES

The Pratt & Whitney Twin Wasp R-1830 (C series) engine is a 14-cylinder version of the Wasp, but with slightly smaller bore and stroke. The S3C4-G model has a 2-speed 1-stage supercharger and it is rated at 1,200 h.p. at take-off with a military rating of 1,050 h.p. at 13,100 ft. (4000 m). The S1C3-G model with the same take-off rating has a 1-speed supercharger and it can be equipped with a General Electric turbo-supercharger. The last-mentioned engine is manufactured under license by the Commonwealth Aircraft Corporation Pty. Ltd. in Australia.

The Pratt & Whitney Twin Wasp R-1830 (C series) engine has also been produced with a 2-speed 2-stage supercharger. On the SSC7-G model, the supercharger comprises a main stage and an auxiliary stage, the latter having a 2-speed impeller. This engine is rated at 1,200 h.p. at take-off with a military rating of 1,100 h.p. at 17,500 ft. (5 300 m).

The Pratt & Whitney Twin Wasp R-2000 (D series) is a 14-cylinder radial similar to the Twin Wasp R-1830, but with a slightly larger bore. The 2SD1-G model has a 2-speed 1-stage supercharger and it is rated at 1,450 h.p. at take-off with a military rating of 1,100 h.p. at 16,000 ft. (4 900 m).

The Pratt & Whitney Double Wasp R-2800 (B series) engine is an 18-cylinder version of the Twin Wasp R-2000, but with a slightly longer stroke. The 2SB-G model has a 2-speed 1-stage supercharger and it is rated at 2,000 h.p. at take-off with a military rating of 1,600 h.p. at 13,500 ft. (4 100 m). The TSB1-G model of the series with the same take-off rating has a 1-speed supercharger and it can be equipped with a General Electric turbo-supercharger.

The Pratt & Whitney Double Wasp R-2800 (B series) engine is also built with a 2-speed 2-stage supercharger. On the SSB2-G model, the supercharger consists of a main stage and an auxiliary stage, the latter having a 2-speed impeller. This engine is rated at 2,000 h.p. at take-off with a military rating of 1,650 h.p. at 22,500 ft. (6 800 m).

The Pratt & Whitney Double Wasp R-2800 (C series) engine has forged aluminum alloy cylinder heads permitting machined finning, and improved supercharging. Engines of this series have a take-off rating of 2,100 h.p. All other information is restricted as of January, 1945.

Ranger Aircraft Engines, Division of Fairchild Engine & Airplane Corporation, builds air-cooled inverted in-line engines. The smaller of the two engines now in production is the Ranger 6-440C which is a 6-cylinder unsupercharged power plant. The 6-440C-5 model is rated at 200 h.p. The engine is manufactured under license by Fabrica Nacional de Motores (Government Engine Factory) in Brazil.

The Ranger SGV-770 (C series) engine is a 12-cylinder inverted vee-type power plant of smaller bore and stroke than the 6-440C. Relatively, however, it develops much more power as it is equipped with a 1-speed supercharger and it runs at higher crankshaft speed. It has Al-Fin cylinder barrels (steel barrels with integral aluminum alloy fins) which greatly improve its cooling. The SGV-770C-1B model is rated at 520 h.p. at take-off with a military rating of 520 h.p. at 12,000 ft. (3 700 m).

The Ranger SGV-770 (D series) engine is a new improved version of the SGV-770 C-series engine. It is equipped with a 1-speed supercharger and a special Bendix-Stromberg carburetor which provides direct fuel injection onto the supercharger impeller. It is rated at 700 h.p. at take-off and 600 h.p. at 8,000 ft. (2 400 m).

Studebaker Corporation (Aviation Division) is building 9-cylinder air-cooled Wright R-1820 (G series) C9GC radial engines.

Warner Aircraft Corporation builds 7-cylinder air-cooled radial engines none of which are supercharged. The smallest one is the Scarab 50 which is rated at 130 h.p. at take-off.

The Warner Super Scarab 185 is a new engine which is similar to the Super Scarab 165, but it has a slightly larger bore. The Super Scarab 185 is rated at 200 h.p. at take-off and it is intended for post-war aircraft.

White Aeronautical Corporation has developed a new 5-cylinder air-cooled radial engine suitable for post-war use. The R-275S model is not supercharged and it is rated at 115 h.p. at take-off.

Wright Aeronautical Corporation builds air-cooled radial engines. The smallest one is the 7-cylinder Whirlwind R-760 which is equipped with a ground blower. The R-760-E2 model is rated at 350 h.p. at take-off. This engine is no longer manufactured by Wright, but it is built under license by Fabrica Nacional de Motores in Brazil.



WRIGHT POWERED ASSEMBLY LINES-UNITED STATES

The Wright Whirlwind R-975 is a 9-cylinder version of the Whirlwind R-760. The R-975-E3 model has a 1-speed supercharger and it is rated at 450 h.p. at take-off and 420 h.p. at 1,400 ft. (450 m). This engine is no longer being produced by Wright, but it is manufactured under license by Fabrica Nacional de Motores in Brazil.

The Wright Cyclone 7 R-1420 engine is a new 7-cylinder version of the Wright Cyclone 9. It embodies the latest improvements such as cylinders with W-type aluminum alloy cooling fins permanently secured to the barrels, and forged aluminum alloy cylinder heads permitting the machining of deeper and thinner fins. The 735C7BA1 commercial model has a 2-speed supercharger and it is rated at 700 h.p. at take-off with a normal rating of 500 h.p. at 17,000 ft. (5 200 m).

The Wright Cyclone 9 R-1820 is a 9-cylinder engine of nearly twice the displacement of the Whirlwind R-975. The Cyclone 704C9GC of the G series is equipped with a 2-speed supercharger and it is rated at 1,200 h.p. at take-off with a military rating of 1,000 h.p. at 14,200 ft. (4 300 m). The 666C9GC model of this series has the same take-off rating, but it is equipped with a 1-speed supercharger and it can be used with a General Electric turbo-supercharger.

The Wright Cyclone 9 G-1820 C9HC engine of the more recent H series has the new cylinders with W-type aluminum alloy cooling fins and forged aluminum alloy cylinder heads. The 806C9HCl model of this series is equipped with a 2-speed supercharger and it is rated at 1,350 h.p. at take-off with a military rating of 1,000 h.p. at 17,500 ft. (5 300 m). The 805C9HCl model is also rated at 1,350 h.p. at take-off, but it has a 1-speed supercharger so that it is suitable for use with a turbo-supercharger.

The Wright Cyclone 14 R-2600 engine is a 14-cylinder version of the Cyclone 9, but with a slightly shorter stroke. The Cyclone 776C14BB of the B series is one of the latest models and it has the new W-type aluminum alloy cooling fins. It is equipped with a 2-speed supercharger and it is rated at 1,900 h.p. at take-off with a military rating of 1,450 h.p. at 15,000 ft. (4 600 m).

The Wright Cyclone 18 R-3350 engine is an 18-cylinder version of the Cyclone 14. Cyclone C18 B-series engines are equipped with the new W-type aluminum alloy cooling fins. The 711C18BA2 model has a 2-speed supercharger and it is rated at 2,200 h.p. at take-off with a military rating of 1,800 h.p. at 14,000 ft. (4 300 m). The 670C18BA model with the same take-off rating has a 1-speed supercharger and it can be equipped with two General Electric turbo-superchargers.

AIRBORNE AUXILIARY POWER PLANTS

Andover Motors Corporation builds an airborne auxiliary electric generating plant known as the Andover V-32. It is powered with a 2-cylinder 90 degrees vee-type air-cooled engine having a continuous rating of 10 h.p. at sea level.

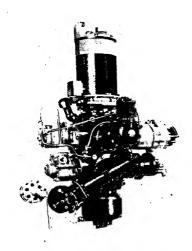
Eclipse-Pioneer Division of the Bendix Aviation Corporation manufactures an airborne auxiliary electric generating plant known as the Eclipse NEG. It has a 1-cylinder vertical air-cooled engine of the 2-cycle type with a continuous rating of 4 h.p. at sea level.

Lawrance Aeronautical Corporation now manufactures three types of airborne auxiliary electric generating plants. The Lawrance 20A generating plant has a 2-cylinder horizontally-opposed air-cooled engine with a continuous rating of 10 h.p. at sea level and 7.5 h.p. at 10,000 ft. (3 000 m). The Lawrance 30C and 30D generating plants are both powered with 2-cylinder horizontally-opposed air-cooled engines of larger displacement than the engine used for the 20A generating plant. These larger engines have a continuous rating of 10 h.p. at sea level and 5.7 h.p. at 20,000 ft. (6 100 m).

D. W. Onan & Sons has three types of airborne auxiliary electric generating plants in production. Onan IC series generating plants are quite small and they are powered with a 1-cylinder vertical air-cooled engine having a continuous rating of 1.1 h.p. at sea level and 0.9 h.p. at 10,000 ft. (3 000 m). Onan OTC series generating plants are powered with a 2-cylinder horizontally-opposed air-cooled engine having a continuous rating of 4 h.p. at sea level and 3.5 h.p. at 10,000 ft. (3 000 m). Onan OFA series generating plants are powered with a 4-cylinder horizontally-opposed version of the engine used for the OTC series generating plants. This larger engine has a continuous rating of 11.7 h.p. at sea level and 6.5 h.p. at 18,000 ft. (5 500 m).

GREAT BRITAIN

Great Britain's aircraft engine industry has made many important contributions to aviation in recent years. In the high-powered engine field, Bristol has pioneered the sleeve valve to the point where it is now used on all the latest Bristol air-cooled radials. Napier also uses sleeve valves in its new liquid-cooled Sabre engine thereby reducing its overall width and making it a very compact power plant. Rolls-Royce



ROTOL ACCESSORY GEAR BOX GREAT BRITAIN

has continued the development of its high-powered Merlin and Griffon liquid-cooled vee-type engines. It is also producing highly efficient gear-driven 2-speed 2-stage superchargers which maintain sea level atmospheric pressure in the intake manifolds of its engines to an altitude of more than 40,000 ft. (12 200 m).

Alvis has now completed the development of a medium-powered air-cooled radial engine for post-war feeder line aircraft. Rotol is producing a new airborne auxiliary electric generating plant powered with a sleeve-valve engine for use in large aircraft. It is also manufacturing important engine equipment such as remote drive accessory gear boxes, cooling fans and propellers. Vokes—a pioneer in filtration for the past 25 years—has continued its development and manufacture of high efficiency air filters

of the dry and viscous types, and fuel and lubricating oil filters. These filters are now standard on many of the latest British and American aircraft engines.

In the jet propulsion field, British Thomson-Houston has continued its development of the Whittle jet engine of the gas turbine type and has now placed this engine in production. In addition, B.T.H. is producing large quantities of magnetos, starters and generators.

Alvis Limited builds air-cooled radial engines. The Alvis Leonides is a 9-cylinder radial which was ready for production just prior to World War II, but which was set aside temporarily when Alvis was called upon to make parts for high-powered military aircraft engines. The Leonides has a 1-speed supercharger and it is rated at 450 h.p. at take-off and 435 h.p. at 8,250 ft. (2 500 m). It is scheduled for post-war production.



BRISTOL CONVEYOR LINE-GREAT BRITAIN

Armstrong Siddeley Motors Limited builds air-cooled radial engines. The current production engine is the 7-cylinder Cheetah which is equipped with a 1-speed supercharger. The Cheetah XV is rated at 420 h.p. at take-off with a military rating of 400 h.p. at 4,000 ft. (1 200 m).

The Armstrong Siddeley Tiger is a 14-cylinder engine of larger bore and stroke than the Cheetah. The Tiger VIII has a 2-speed supercharger and it is rated at 920 h.p. at take-off and 780 h.p. at 14,250 ft. (4 300 m).

Bristol Aeroplane Company Limited builds air-cooled radial engines with both poppet valves and sleeve valves. The poppet-valve engines are the Mercury and the Pegasus. Both of these are 9-cylinder power plants. The Mercury XV and XXV have 1-speed superchargers and are rated at 905 h.p. at take-off with a military rating of 995 h.p. at 9,250 ft. (2800 m), using 100/130 grade gasoline.

The Bristol Pegasus engine is similar to the Mercury, but it has a longer stroke. With the exception of the Pegasus XVIII, all engines of this series are equipped with 1-speed superchargers. The Pegasus XVIII has a 2-speed supercharger and it is now rated at 1,050 h.p. at take-off with a military rating of 965 h.p. at 13,000 ft. (4 000 m), using 100/130 grade gasoline.

The Bristol sleeve valve engines in production are the Perseus, the Taurus and the Hercules—developed from the prototype Aquila. The Perseus is a 9-cylinder radial. The Perseus XVI is equipped with a 1-speed supercharger and it is rated at 905 h.p. at take-off with a military rating of 955 h.p. at 5,000 ft. (1 500 m).

The Bristol Taurus engine is a 14-cylinder radial of smaller bore and stroke than the Perseus. The Taurus XII has a 1-speed supercharger and it is rated at 1,085 h.p. at take-off with a military rating of 1,130 h.p. at 3,500 ft. (1 100 m).

The Bristol Hercules engine is a 14-cylinder version of the Perseus. All of the more recent models are equipped with 2-speed superchargers. The Hercules XVI is rated at 1,615 h.p. at take-off with a military rating of 1,455 h.p. at 12,000 ft. (3 600 m). The Hercules XVII and the Hercules XVIII are both rated at 1,725 h.p. at take-off, with a military rating of 1,735 h.p. at 500 ft. (150 m) for the Hercules XVII and 1,565 h.p. at 8,000 ft. (2 400 m) for the Hercules XVIII.

The Bristol Centaurus is an 18-cylinder engine similar in construction to the Hercules, but it is of slightly larger individual cylinder displacement. It has an output of considerably more than 2,000 h.p.

The British Thomson-Houston Company Limited builds jet propulsion engines of Whittle design. B.T.H. jet engines are of the gas turbine type.¹

Cirrus engines manufactured by the Cirrus Engine Department of Blackburn Aircraft Limited, comprise three 4-cylinder air-cooled inverted in-line power plants none of which are supercharged. The smallest one is the 90 h.p. Cirrus Minor (Series I).

The Cirrus Minor (Series II) is similar to the Cirrus Minor (Series I) engine, except that it has a slightly larger bore. It is rated at 100 h.p. at take-off.

The Cirrus Major engine has a larger bore and stroke than the Cirrus Minor power plants. The Cirrus Major (Series I) is rated at 150 h.p. at take-off.

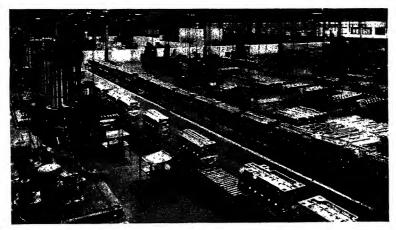
De Havilland Aircraft Company Limited builds air-cooled inverted in-line engines. Only the Gipsy Major and the Gipsy Six are active at

¹ See Jet Propulsion section of this book, pages 336 to 339.

present, but new engines are under development. The Gipsy Major I is a 4-cylinder unsupercharged engine which is rated at 130 h.p. at take-off. This engine is also built under license by General Motors-Holdens Pty. Ltd. in Australia.

The De Havilland Gipsy Six engine is a 6-cylinder version of the Gipsy Major. The Gipsy Six I (Gipsyqueen III) and the Gipsy Six II (Gipsyqueen I and II) are not supercharged. The Gipsy Six II engines are rated at 210 h.p. at take-off.

The De Havilland Gipsy Six IIIS (Gipsyqueen IV) engine is similar to the Gipsy Six II, but it is of slightly larger bore and stroke. It has a 1-speed supercharger and it is rated at 285 h.p. at take-off and 265 h.p. at 7,000 ft. (2 100 m).



NAPIER CRANKCASE MACHINE SHOP-GREAT BRITAIN

D. Napier & Son Limited now builds liquid-cooled horizontal H-type engines. Prior to World War II, however, it manufactured air-cooled vertical H-type power plants. Its outstanding air-cooled engine was the 24-cylinder poppet-valve Dagger. The Dagger VIII was equipped with a 1-speed supercharger and it was rated at 955 h.p. at take-off with a military rating of 1,000 h.p. at 8,750 ft. (2 700 m).

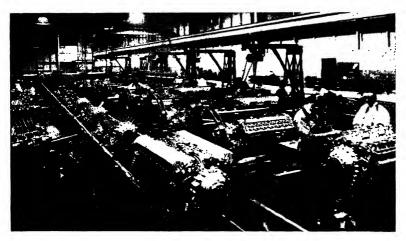
The Napier Sabre which is now in production is a liquid-cooled horizontal H-type engine with 24 opposed cylinders and sleeve valves. Virtually, it consists of two 12-cylinder opposed engines, one on top of the other. The two cylinder blocks are attached horizontally to the crankcase. The two crankshafts are connected to the propeller shaft by compound reduction gears. The Sabre IIA is equipped with a 2-speed supercharger and it is rated at 2,200 h.p. at take-off. The Sabre IIB develops 2,400 h.p. at take-off.

Rolls-Royce Limited builds liquid-cooled in-line engines. The basic engine in the years prior to World War II was the Kestrel from which the Peregrine was developed. The Peregrine I is a modern engine equipped with a 1-speed supercharger. It is rated at 765 h.p. at take-off with a military rating of 960 h.p. at 12,000 ft. (3 700 m).

The Rolls-Royce Vulture is a 24-cylinder X-type version of the Peregrine. The Vulture II has a 2-speed supercharger and it is rated at 2,010 h.p. at take-off with a military rating of 1,710 h.p. at 15,000

ft. (4 600 m).

The Rolls-Royce Merlin is a 12-cylinder vee-type engine which is a modernized scaled-up version of the Kestrel. The Merlin 45 is a recent model equipped with a 1-speed 1-stage supercharger. It is rated at



ROLLS-ROYCE ASSEMBLY LINE—GREAT BRITAIN

1,185 h.p. at take-off with a military rating of 1,515 h.p. at 11,000 ft. (3 400 m). The Merlin 32 of the same series which is used in carrier-based torpedo planes develops its maximum power at take-off and at low altitudes.

The Rolls-Royce Merlin XX is one of the best known models equipped with a 2-speed 1-stage supercharger. This engine is rated at 1,280 h.p. at take-off with a military rating of 1,480 h.p. at 12,500 ft. (3 800 m).

The Rolls-Royce Merlin 61 was the first production engine to be equipped with a 2-speed 2-stage supercharger. It is rated at 1,290 h.p. at take-off with a military rating of 1,390 h.p. at 23,500 ft. (7200 m).

The Rolls-Royce Merlin 63 and Merlin 63A engines equipped with 2-speed 2-stage superchargers have a maximum output of more

than 1,650 h.p. The Merlin 72 and the Merlin 73 of this series are credited with an output of 1,750 h.p. at take-off.

Rolls-Royce Merlin engines are now manufactured under license by the Continental Aviation & Engineering Corporation and the Packard Motor Car Company in the United States of America.¹

The Rolls-Royce Griffon is a new 12-cylinder vee-type engine which is of 36 per cent greater displacement than the Merlin. It has the same displacement as the Rolls-Royce Buzzard which was manufactured in England some years ago. It also has the same bore and stroke as the Rolls-Royce R racing engine developed from the Buzzard. The racing engine was rated at 2,600 h.p. when it won the Schneider Trophy outright for Great Britain in 1931.

The Rolls-Royce Griffon IV is a relatively low altitude engine which is equipped with a 2-speed 1-stage supercharger. It has a maximum output of from 1,750 h.p. to 2,000 h.p.

The Rolls-Royce Griffon 65 has a 2-speed 2-stage supercharger which gives it an excellent performance at high altitudes. This engine has a maximum output of from 2,000 h.p. to 2,200 h.p.

The Whittle jet propulsion engine of the gas turbine type developed by Power Jets Limited is now being manufactured by the British Thomson-Houston Company Ltd. Royal Air Force interceptors powered with Whittle jet engines are now in service, but no specific details of the engine are available as of January, 1945.

AIRBORNE AUXILIARY POWER PLANTS

Rotol Limited builds airborne auxiliary electric generating plants for use on large aircraft. The Rotol P-6 generating plant has a 6-cylinder horizontally-opposed air-cooled engine with sleeve valves. This engine has a continuous rating of 60 h.p. at sea level and at 12,000 ft. (3 700 m). It drives both an A.C. alternator and a D.C. electric generator.

AUSTRALIA

Australia manufactures three types of aircraft engines—two of American design and one of British origin. Commonwealth Aircraft Corporation and General Motors-Holdens are the producers of these power plants.

Commonwealth Aircraft Corporation Pty. Ltd. builds two types of American Pratt & Whitney air-cooled radial engines under license. The Australian-built 9-cylinder Wasp R-1340 S1H1-G has a 1-speed supercharger and it is rated at 600 h.p. at take-off and 550 h.p. at 5,000 ft. (1 500 m). The Australian-built 14-cylinder Twin Wasp R-1830 S1C3-G also has a 1-speed supercharger and it has a rating of 1,200 h.p. at take-off with a military rating of 1,200 h.p. at 3,700 ft. (1 100 m).

¹For Rolls-Royce Merlin engines built in the United States of America, see pages 122 to 127 inclusive.

General Motors-Holdens Ltd. builds the British De Havilland Gipsy Major 4-cylinder inverted in-line air-cooled engine under license. The Australian-built Gipsy Major I is not supercharged and it is rated at 132 h.p. at take-off.

BRAZIL

Brazil manufactures three types of aircraft engines all of which are of American (U.S.A.) design. Both in-line and radial engines are to be produced in the recently completed Brazilian Government Engine Factory.

Fabrica Nacional de Motores (Government Engine Factory) builds Ranger and Wright air-cooled engines under license. The Brazilian-built Ranger 6-440C-5 6-cylinder inverted in-line engine is not supercharged and it is rated at 200 h.p. The Brazilian-built Wright Whirlwind R-760-E2 7-cylinder radial is ground boosted and it is rated at 350 h.p. at take-off. The Brazilian-built Wright Whirlwind R-975-E3 9-cylinder engine has a 1-speed supercharger and it is rated at 450 h.p. at take-off and 420 h.p. at 1,400 ft. (400 m).

FRANCE

In the past, France has shown considerable productivity in the aircraft engine field. When French engines resume their place in aviation it will be seen that their development has not been neglected. Already, important projects are under way.

Béarn engines built by S.A. Constructions Mécaniques du Béarn are newcomers in the aviation field. The Béarn 6-cylinder air-cooled inverted in-line engine resembles the Renault 6Q, except that it is of slightly larger displacement. The Béarn 6D has a 1-speed supercharger and it is rated at 375 h.p. at take-off and 350 h.p. at 6,500 ft. (2 000 m), using 87-octane gasoline. It develops 410 h.p. at take-off with 100-octane gasoline.

Gnome et Rhône (Société des Moteurs) built air-cooled radial engines of two sizes prior to World War II. Both of these engines—the 14M and the 14N—were 14-cylinder power plants. The Gnome-Rhone 14M-8 had a 1-speed supercharger and it was rated at 750 h.p. at takeoff and 680 h.p. at 7,000 ft. (2 100 m). The Gnome-Rhone 14N-48 which was of more than twice the displacement of the 14M series engines, was rated at 1,180 h.p. at take-off and 1,060 h.p. at 12,800 ft. (3 900 m). The Gnome-Rhone 14N-50 was equipped with a 2-speed supercharger and it was rated at 1,400 h.p. at take-off and 1,200 h.p. at 13,100 ft. (4 000 m).

The Gnome-Rhone 14R is a new 14-cylinder radial of the same displacement as the 14N series engines from which it was developed. The 14R-4 model has a 2-speed supercharger and it is rated at 1,590 h.p. at take-off with a military rating of 1,580 h.p. at 18,000 ft. (5 500 m).

The Gnome-Rhone 18R is an 18-cylinder version of the 14R engine. The 18R-1 is equipped with a 2-speed supercharger and it is rated at 2,200 h.p. at take-off and 2,150 h.p. at 22,300 ft. (6 800 m).

The Gnome-Rhone 28R is a 28-cylinder version of the 14R engine. Its cylinders are arranged in 4 rows of 7 cylinders each around a barrel-type crankcase. It has a 4-throw crankshaft and a fan is provided to assist cooling. It has two superchargers and direct fuel injection. It is designed for an output of 3,000 h.p. At present, it is in the project stage.

Hispano-Suiza (Société Francaise) built both air-cooled and liquid-cooled engines prior to World War II. Its air-cooled engines were the 14AA and the 14AB both of which were 14-cylinder radials equipped with 1-speed superchargers. The Hispano-Suiza 14AA was rated at 1,150 h.p., and the smaller Hispano-Suiza 14AB was rated at 750 h.p., both ratings being at 13,100 ft. (4 000 m).

The Hispano-Suiza 12X, 12Y, 12Z and 24Y are all liquid-cooled engines. Many of them have hollow propeller shafts for mounting a cannon. The 12X is a 12-cylinder vee-type engine equipped with a 1-speed supercharger. The 12X-12 is rated at 740 h.p. at take-off with a military rating of 690 h.p. at 12,800 ft. (3 900 m).

The Hispano-Suiza 12Y is a 12-cylinder vee-type engine of considerably larger displacement than the 12X from which it was developed. All models of the 12Y engine are equipped with 1-speed superchargers. The most recent engines of the series are the 12Y-50 and 12Y-51 which are rated at 1,100 h.p. at take-off with a military rating of 1,000 h.p. at 10,800 ft. (3 300 m).

The Hispano-Suiza 12Z is a new 12-cylinder vee-type engine with the same displacement as the 12Y power plant. It embodies a number of modifications such as 2 inlet valves and 2 exhaust valves per cylinder instead of the 1 inlet valve and 1 exhaust valve per cylinder on the 12Y. It is designed for direct fuel injection. The 12Z-1 has a 1-speed supercharger and it is rated at 1,300 h.p. at take-off with a military rating of 1,200 h.p. at 13,100 ft. (4 000 m) using 92-octane gasoline. It develops 1,500 h.p. at take-off with 100-octane gasoline.

The Hispano-Suiza 24Y is a 24-cylinder vertical H-type engine which utilizes four 12Y cylinder blocks and many other parts of this last-mentioned engine. The 24Y-90 has two 1-speed superchargers and it is designed for a take-off output of 2,200 h.p. It is in the project stage.

Mathis S.A. developed a 42-cylinder liquid-cooled engine known as the Mathis 42B just prior to World War II. It had 7 banks of 6 inline cylinders arranged around a common crankcase. It was equipped with a 2-speed supercharger and it was designed for a maximum output of 2,800 h.p. It is still in the experimental stage.

Renault (S.A. des Usines) built three sizes of air-cooled inverted inline engines prior to World War II. These engines had many parts in common such as cylinders, pistons, connecting rods and valve gear. The smallest one was the 4-cylinder Renault 4P-ei (Bengali) which

was not supercharged and which was rated at 140 h.p.

The Renault 6Q was a 6-cylinder version of the 4P engine, but it developed considerably more power as it had a 1-speed supercharger. The Renault 6Q-04 was rated at 220 h.p. at take-off and 240 h.p. at 14,100 ft. (4 300 m).

The Renault 12R was a 12-cylinder inverted vee-type version of the Renault 6Q. It had a 1-speed supercharger and it was rated at 500 h.p. at take-off and 450 h.p. at 13,100 ft. $(4\,000\,\mathrm{m})$.

GERMANY

Germany has made great progress in the aircraft engine field in recent years. It is the only country which has successfully operated Diesel aircraft engines in regular service. It has pioneered direct fuel injection to the point where it is now used on all high-powered aircraft engines in Germany. It was the first country to adapt hydraulic drive to superchargers providing variable speeds for the impeller. Now, it is well advanced in the art of jet propulsion as is shown by its extensive use of gas turbine jet engines and rocket power.²

Seven firms are responsible for the basic designs of German aircraft engines of the reciprocating type. These firms and the serial numbers allocated to their products are: Argus (400); B.M.W. (100 and 800); Bramo B.M.W. (300); Daimler-Benz (600); Hirth (500); Junkers (200); and Zündapp (900). Jet propulsion engines of the gas turbine type are built by B.M.W. (003) and Junkers (004).

Argus Motoren G.m.b.H. builds air-cooled inverted-vee type engines. The Argus As 10-C3 is an 8-cylinder unsupercharged engine which is rated at 220 h.p. The supercharged version known as the As 401 is rated at 275 h.p. at take-off and 270 h.p. at 9,800 ft. (3 000 m).

The Argus As 410 is a 12-cylinder engine of smaller bore and stroke than the As 10-C3. It develops considerably more power, however, as it has a higher compression ratio and a higher crankshaft speed and it uses higher grade fuel. The Argus As 410-A1 is equipped with a 1-speed supercharger and it is rated at 450 h.p. at take-off and 360 h.p. at 9,800 ft. (3 000 m). The most recent model of this series is the As 411 which is rated at 500 h.p. at take-off with a military rating of 450 h.p. at 13,100 ft. (4 000 m).

B.M.W. (Bayerische Motoren Werke A.G.—now BMW Flugmotorenbau G.m.b.H.) builds air-cooled radial engines. The B.M.W. 132 is a 9-cylinder radial which was developed from the American Pratt & Whitney Hornet The B.M.W. 132-K is a recent model which is equipped with direct fuel injection and a 1-speed supercharger. It is rated at 1,000 h.p. at take-off and 960 h.p. at 9,800 ft. (3 000 m).

The B.M.W. 801 is a 14-cylinder radial which is notable for being the first high-powered air-cooled aircraft engine to have its cooling assisted by a fan. All models of this engine are equipped with direct

¹See Aircraft Diesels, by Paul H. Wilkinson, published by the Pitman Publishing Corporation, New York and Chicago.

² See Jet Propulsion section of this book, pages 337, 342 and 343.

fuel injection and 2-speed superchargers. The B.M.W. 801-D1 is rated at 1,700 h.p. at take-off with a military rating of 1,600 h.p. at 19,800 ft. (6 000 m).

The B.M.W. 802 is an 18-cylinder version of the B.M.W. 801. It is equipped with a 2-speed supercharger and it is rated at 2,000 h.p. at take-off with a military rating of 2,200 h.p. at 18,000 ft. (5 500 m).

The B.M.W. 003 is a jet propulsion engine of the gas-turbine type. Bramo (Brandenburgische Motorenwerke G.m.b.H. — now BMW Flugmotorenwerke Brandenburg G.m.b.H.) builds air-cooled radial engines. The Bramo Sh 14A is a small unsupercharged 7-cylinder radial which originally was of Siemens design. The Sh 14A-4 is rated at 160 h.p. at take-off.

The Bramo Fafnir 323 is a 9-cylinder radial of approximately the same displacement as the B.M.W. 132. The most recent model is the Fafnir 323-P1 which is equipped with direct fuel injection and a 2-speed supercharger. It is rated at 985 h.p. at take-off with a military rating of 775 h.p. at 13,900 ft. (4 200 m).

Daimler-Benz builds liquid-cooled in-line engines. All of its engines are now equipped with hydraulic-drive variable-speed 1-stage superchargers and direct fuel injection. The DB 601-E is a recent 12-cylinder inverted vee-type engine which is rated at 1,375 h.p. at take-off with a military rating of 1,375 h.p. at 18,000 ft. (5 500 m). The DB 601-F1 has a rating of 1,395 h.p. at take-off and 1,400 h.p. at 19,700 ft. (6 000 m).

The Daimler-Benz DB 603 is a new 12-cylinder engine similar in general design to the DB 601, but it is of 31 per cent greater displacement. The DB 603 is rated at 1,800 h.p. at take-off with a military rating of 1,680 h.p. at 18,000 ft. (5 500 m).

The Daimler-Benz DB 605 is a new improved version of the DB 601, with a slightly larger bore. It has modified cylinder blocks and reduction gear, plain bearings in the connecting rod big-ends, a supercharger impeller of larger diameter, and improved valve gear giving better cylinder scavenging. The DB 605-AI and the DB 605-BI are rated at 1,500 h.p. at take-off with a military rating of 1,350 h.p. at 19,700 ft. (6 000 m).

The Daimler-Benz DB 606 power plant consists of two DB 601-N engines arranged side-by-side and connected through gears and clutches to a common propeller shaft. The DB 606 is rated at 2,400 h.p. at take-off with a military rating of 2,400 h.p. at 16,400 ft. (5000 m).

The Daimler-Benz DB 610 power plant is similar in design to the DB 606, except that it comprises two DB 601-E engines which give it a take-off rating at 2,700 h.p. and a military rating of 2,600 h.p. at 19,000 ft. (5 800 m).

Hirth Motoren G.m.b.H. builds air-cooled inverted in-line engines. Four of them—the 4-cylinder HM 504, the 6-cylinder HM 506, the 8-cylinder HM 508 and the 12-cylinder HM 512—have the same bore and stroke so that many of their parts are interchangeable.

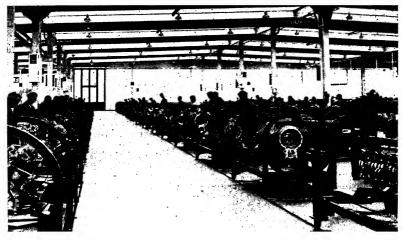
The Hirth HM 504-A2 is a 4-cylinder in-line engine which is not supercharged. It is rated at 95 h.p.

The Hirth HM 506-Al engine is a 6-cylinder version of the HM 504

and it is rated at 145 h.p. It is not supercharged.

The Hirth HM 508 is an 8-cylinder inverted vee-type engine which is equipped with a 1-speed supercharger. The HM 508-D is rated at 280 h.p. at take-off and 260 h.p. at 1,600 ft. (500 m).

The Hirth HM 512 is a 12-cylinder inverted vee-type engine of the same displacement as the 12-cylinder Argus As 410. The HM 512-B has a 1-speed supercharger and and it is rated at 450 h.p. at take-off and 360 h.p. at 9,800 ft. (3 000 m).



JUNKERS FINAL ASSEMBLY LINES-GERMANY

Junkers Flugzeug und Motorenwerke A.G. builds liquid-cooled inline Diesel and gasoline engines. All of them are known by the trade name of *Jumo*. The Diesel engines are the Jumo 205, 206, 207 and 208. These engines function on the 2-cycle principle with direct fuel injection and compression ignition. They have 6 long vertical in-line open end cylinders with two opposed pistons in each cylinder barrel and a common combustion chamber. The pistons are connected to two crankshafts, one at the top and one at the bottom of the cylinder block. The two crankshafts are geared to a common propeller shaft.

The Junkers Jumo 205 Diesel is equipped with a 1-speed supercharger which also serves as a scavenging blower. The Jumo 205-Ea is rated at 700 h.p. at take-off and 650 h.p. at 8,200 ft. (2500 m).

The Junkers Jumo 206 Diesel is similar to the Jumo 205, but it has a considerably larger bore giving it 53 percent greater displacement.

It is equipped with a 1-speed supercharger and it is rated at 1,200 h.p. at take-off and 1,000 h.p. at 9,800 ft. (3 000 m).

The Junkers Jumo 207 Diesel is a turbo-supercharged version of the Jumo 205. The Jumo 207-A is rated at 1,000 h.p. at take-off with a military rating of 1,000 h.p. at 32,800 ft. (10 000 m).

The Junkers Jumo 208 Diesel is a turbo-supercharged version of the Jumo 206. It is rated at 1,500 h.p. at take-off with a military rat-

ing of 1,500 h.p. at 26,000 ft. (8 000 m).

The Junkers Jumo 211 is a 12-cylinder inverted vee-type gasoline engine designed for military purposes. All models of the Jumo 211 are equipped with 2-speed superchargers and direct fuel injection. The Jumo 211-J is equipped with an intercooler and it is rated at 1,350 h.p. at take-off with a military rating of 1,260 h.p. at 16,400 ft. (5 000 m).

The Junkers Jumo 213 engine is a new modified version of the Jumo 211, with a slightly larger bore. The Jumo 213-A has a 2-speed supercharger with an intercooler, and direct fuel injection. It is rated at 1,700 h.p. at take-off with a military rating of 1,500 h.p. at 19,800 ft. (6 000 m).

The Junkers Jumo 004 is a jet propulsion engine of the gas turbine

Zündapp Werke A.G. builds small air-cooled in-line engines. The Zündapp Z 909-2AO is not supercharged and it is rated at 50 h.p.

ITALY

Italian aircraft engines in production in 1943 were all of the aircooled type. Most of them originally were of American, British or French design. The exceptions were the Isotta Fraschini Delta engine and the experimental Campini jet propulsion engine both of which were of Italian design. Engine production was confined to four firms—Alfa Romeo, Fiat, Isotta Fraschini and Piaggio.

Alfa Romeo S.A. built inverted in-line and radial engines. There were two in-line engines many of the parts of which were interchangeable. These engines were similar to the British De Havilland Gipsy Major and Gipsy Six, and neither of them was supercharged. The smaller one was the 4-cylinder Alfa 110-1 which was rated at 130 h.p. at take-off.

The Alfa Romeo Alfa 115 was a 6-cylinder version of the Alfa 110. The Alfa 115-1 was rated at 205 h.p. at take-off.

The Alfa Romeo Alfa 126 was a 9-cylinder radial similar to the British Bristol Pegasus. The Alfa 126-RC34 was equipped with a 1-speed supercharger and it was rated at 780 h.p. at take-off and at 11,500 ft. (3 500 m). The Alfa 128-RC21 of the same series was rated at 950 h.p. at take-off and 860 h.p. at 6,900 ft. (2 100 m).

The Alfa Romeo Alfa 135 was an 18-cylinder version of the Alfa 126, but with a shorter stroke. The Alfa 135-RC32 had a 1-speed supercharger and it was rated at 1,620 h.p. at take-off with a military rating

of 1,400 h.p. at 10,500 ft. (3 200 m).

Fiat S.A. built three sizes of radial engines. The Fiat A74 was a 14-cylinder engine equipped with a 1-speed supercharger. The A74-RC38 was rated at 890 h.p. at take-off and 840 h.p. at 12,500 ft. (3 800 m). The A76-RC40 of slightly larger displacement than the A74 series engines was rated at 1,100 h.p. at take-off and 1,000 h.p. at 13,100 ft. (4 000 m).

The Fiat A80 was a 14-cylinder engine similar to the A74, but with a longer stroke. The A80-RC41 had a 1-speed supercharger and it was rated at 1,030 h.p. at take-off and 1,000 h.p. at 13,500 ft. (4 100 m).

The Fiat A82 was an 18-cylinder radial similar to the A80, but with a slightly longer stroke. It was equipped with a 1-speed supercharger and it was rated at 1,400 h.p. at take-off and 1,250 h.p. at 13,800 ft. (4 200 m).

Isotta Fraschini (Fabrica Automobili) built inverted in-line engines. The Beta was a recent engine which was a 6-cylinder version of the 12-cylinder 550 h.p. inverted vee Isotta Fraschini Gamma. The Beta had a 1-speed supercharger and it was rated at 300 h.p. at take-off and 270 h.p. at 4,600 ft. (1 400 m).

The Isotta Fraschini Delta was a 12-cylinder inverted vee-type engine. It also had been developed from the Gamma, but it was of considerably larger displacement than this last-mentioned engine. There were several models of the Delta some of which had a raised hollow propeller shaft through which a cannon could be fired. The RC35-IDS had a 1-speed supercharger and it was rated at 770 h.p. at take-off with a military rating of 1,350 h.p. at 11,500 ft. (3 500 m).

Piaggio & Co. S.A. built five sizes of radial engines based upon French Gnome-Rhone designs. The smallest one was the P.VII which was a 7-cylinder engine. The P.VII-C35 had a 1-speed supercharger and it was rated at 500 h.p. at take-off with a military rating of 460 h.p. at 11,500 ft. (3 500 m).

The Piaggio P.X engine was a 9-cylinder version of the P.VII. The P.X-RC35 had a 1-speed supercharger and it was rated at 650 h.p. at take-off with a military rating of 625 h.p. at 11,500 ft. (3 500 m). Other models of the P.X series included the 610 h.p. P.IX-RC40 which had a 2-speed supercharger, and the 700 h.p. P.XVI-RC35D and P.XVI-RC35S engines.

The Piaggio P.XI engine was a 14-cylinder version of the P.VII. The P.XI-RC40 had a 1-speed supercharger and it was rated at 1,000 h.p. at take-off with a military rating of 1,000 h.p. at 13,100 ft. (4000 m).

The Piaggio P.XII engine was an 18-cylinder version of the P.VII. but with a slightly longer stroke. The P.XII-RC35 was equipped with a 1-speed supercharger and it was rated at 1,500 h.p. at take-off with a military rating of 750 h.p. at 13,100 ft. (4 000 m).

The Piaggio P.XXII was an 18-cylinder engine similar to the P.XII. but with a slightly larger bore. The P.XXII-RC35D had a 1-speed supercharger and it was rated at 1,700 h.p. at take-off with a military rating of 1,600 h.p. at 11,500 ft. (3 500 m).

JAPAN

Japanese aircraft engines showed up quite well at the beginning of World War II compared with the engines then in use by other countries. This was due to the Japanese policy of importing leading American, British, French and German engines, building a few of them under license, and then combining their best features into engines of their own. Since the outbreak of war, the Japanese have continued their development work with German technical assistance. In addition to powerful air-cooled radial engines of from 1,800 h.p. to 2,000 h.p., they now have in production liquid-cooled engines similar to the German Daimler-Benz DB 601. Recent improvements such as water injection and 2-stage superchargers are beginning to be found on the latest Japanese power plants.

Most of the aircraft engines produced by the Japanese are of the air-cooled radial type. Mitsubishi and Nakajima are responsible for the high-powered engines, and Hitachi (formerly Tokyo Gasu Denki) builds the low-powered engines needed for training purposes. Aichi and Nakajima are now manufacturing liquid-cooled inverted vee-type engines for Japan's high-altitude fighters. Other firms such as Showa and Tachikawa (formerly Ishikawajima) produce engines to the designs of the afore-mentioned firms, or manufacture component parts for them.

Aichi Tokei Denki K.K. builds the Atsuta which is a 12-cylinder liquid-cooled engine similar to the German Daimler-Benz DB 601-A inverted vee-type power plant. The Atsuta 21 is equipped with a hydraulic-drive variable-speed supercharger and direct fuel injection. It is rated at 1,200 h.p. at take-off with a military rating of 1,100 h.p. at 13,500 ft. (4 100 m).

Hitachi Kokuki K.K. builds relatively small air-cooled radial engines. The smallest one is the 5-cylinder Hatsukaze which is rated at 90 h.p. The Kamikaze is a 7-cylinder version of the Hatsukaze and it is rated at 130 h.p. These engines are not supercharged.

The Hitachi Amakaze is a 9-cylinder engine of larger bore and stroke than the Hatsukaze and the Kamikaze. The Amakaze 11 is not supercharged and it is rated at 300 h.p.

Kawasaki Kokuki K.K. has specialized in liquid-cooled engines for a number of years. Prior to World War II, it manufactured 12-cylinder vee-type engines developed from the German B.M.W. VI. Now, it is producing a 12-cylinder inverted vee-type power plant similar to the German Daimler-Benz DB 601-A. The Kawasaki Type 2, as this latest engine is known, is rated at 1,200 h.p. at take-off with a military rating of 1,100 h.p. at 13,500 ft. (4 100 m).

Mitsubishi Kokuki Kabushiki K. now builds air-cooled radial engines exclusively. The Mitsubishi Miozio was one of the first engines to be placed in production in the earlier stages of the Japanese warplane program. It was a 9-cylinder radial similar to the American Pratt & Whitney Hornet. It had a 1-speed supercharger and it was rated at 800 h.p. at take-off and 750 h.p. at 13,100 ft. (4 000 m).

The Mitsubishi Zuisei is a fairly recent 14-cylinder engine which is similar to the Pratt & Whitney Twin Wasp Junior. The Zuisei 13 has a 1-speed supercharger and it is rated at 850 h.p. at take-off with a military rating of 860 h.p. at 13,100 ft. (4000 m).

The Mitsubishi Kinsei is a modern engine which has been in production since 1938. Its cylinders are of practically the same size as those of the British Armstrong Siddeley Tiger and it embodies many of the features of this last-mentioned engine including its valve gear and supercharger. The nose portion of the Kinsei containing the reduction gear, however, resembles that of the American Pratt & Whitney Twin Wasp. The Kinsei 44 is equipped with a 1-speed supercharger and it is rated at 1,000 h.p. at take-off with a military rating of 1,075 h.p. at 13,100 ft. (4000 m). The more recent Kinsei 45 and Kinsei 46 also have 1-speed superchargers and they are rated at 1,000 h.p. at take-off with a military rating of 1,050 h.p. at 14,100 ft. (4300 m).

The Mitsubishi Type 1 engine is a 14-cylinder version of the Miozio. It is of larger displacement than the Kinsei. The Mitsubishi Type 1 has a 2-speed supercharger and it is rated at 1,100 h.p. at take-off and 1,100 h.p. at 10,000 ft. (3 000 m). It was the prototype of the Mitsubishi Kasei.

The Mitsubishi Kasei is a new 14-cylinder radial developed from the Mitsubishi Type 1. It is the most powerful 14-cylinder engine in production in Japan. The Kasei 11 and Kasei 15 are rated at 1,500 h.p. at take-off with a military rating of 1,350 h.p. at 13,100 ft. (4 000 m). The Kasei 21, 22 and 25 are the latest models of the series and they are rated at 1,800 h.p. at take-off with a military rating of 1,500 h.p. at 16,400 ft. (5 000 m). All of these engines have 2-speed superchargers, and some of the latest ones are equipped with water injection.

Nakajima Hikoki K.K. builds air-cooled radial engines. The Nakajima Kotubuki is a 9-cylinder engine similar to the British Bristol Jupiter, but of smaller displacement. The Kotubuki II is rated at 500 h.p. at take-off and 450 h.p. at 12,000 ft. (3 600 m). The more recent Kotubuki III has a rating of 610 h.p. at take-off with a military rating of 680 h.p. at 12,000 ft. (3 600 m). Both of these engines have 1-speed superchargers.

The Nakajima Hikari is a 9-cylinder radial engine similar to the American Wright Cyclone 9. The Hikari I has a 1-speed supercharger and it is rated at 800 h.p. at take-off and 800 h.p. at 13,100 ft. (4000 m). The Hikari II is equipped with a 2-speed supercharger and it has a rating of 1,000 h.p. at take-off with a military rating of 880 h.p. at 16,400 ft. (5000 m).

The Nakajima Type 1 is a 14-cylinder radial which is similar to the 14-cylinder Wright Whirlwind GR-1510. It has a 1-speed supercharger and it is rated at 900 h.p. at take-off and 900 h.p. at 12,000 ft. (3 600 m). It was the prototype of the Nakajima Sakae.

The Nakajima Sakae is a 14-cylinder radial engine which was developed from the Nakajima Type 1. It was placed in production at

the beginning of World War II. The Sakae 11 is rated at 980 h.p. at take-off with a military rating of 950 h.p. at 10,000 ft. (3 000 m). The Sakae 12 has a rating of 1,000 h.p. at take-off and a military rating of 900 h.p. at 13,100 ft. (4 000 m). These engines have 1-speed superchargers. Later engines of the series such as the Sakae 21 and the Sakae 22 are equipped with 2-speed superchargers. These two lastmentioned engines are rated at 1,150 h.p. at take-off with a military rating of 950 h.p. at 19,700 ft. (6 000 m).

The Nakajima Type 2 engine is an 18-cylinder version of the Sakae. It has a 2-speed supercharger and it is rated at 1,400 h.p. at take-off with a military rating of 1,300 h.p. at 16,400 ft. (5 000 m). It was the prototype of the Nakajima Homare.

The Nakajima Homare is an 18-cylinder version of the Sakae. The Homare 10-20 series engines have 2-speed superchargers. The Homare 21 is one of the latest models and it is rated at 1,800 h.p. at take-off with a military rating of 1,600 h.p. at 16,400 ft. (5 000 m). It has a maximum emergency rating of 2,000 h.p. with water injection.

U. S. S. R.

Considerable progress has been made with aircraft engines in the Soviet Union in recent years. Much of this progress can be attributed to experience gained with some of the best engines of America, Great Britain, France and Germany, together with engineering assistance received from these countries. Both air-cooled and liquid-cooled engines of high power output are now in production in the Soviet Union. All engines are built in government factories and carry the designation "M" together with type number.

The M-11 engine is a small 5-cylinder air-cooled radial which is rated at 100 h.p. A geared version known as the M-11G is rated at 130 h.p. These engines are not supercharged.

The M-15 engine is a 9-cylinder air-cooled radial which was developed from the British Bristol Jupiter. It has a 1-speed supercharger and it is rated at 415 h.p. at take-off and 480 h.p. at 12,000 ft. (3 600 m).

The M-17 engine is a 12-cylinder liquid-cooled vee-type power plant which is similar to the German B.M.W. VI. It is not supercharged and it is rated at 680 h.p.

The M-26 engine is a 7-cylinder radial which is similar to the American Wright Whirlwind R-760. It is equipped with a ground blower and it is rated at 300 h.p.

The AM-38 engine is a 12-cylinder liquid-cooled vee-type power plant which is substantially of Soviet design. It was developed from the AM-34 exhibited at the Paris Aero Show in 1936. The high-altitude AM-38A is equipped with a 2-speed supercharger and it is rated at 1,600 h.p. at take-off with a military rating of 1,400 h.p. at 19,700 ft. (6 000

¹ The AM series engines were designed by Alexander Mikulin whose initials are used to designate them.

m). The low-altitude AM-38B is equipped with a 1-speed supercharger and it is rated at 1,600 h.p. at take-off with a military rating of 1,500 h.p. at 6,600 ft. (2 000 m). The AM-35A engine of the same series has a 2-speed supercharger and it is rated at 1,350 h.p. at take-off with a military rating of 1,000 h.p. at 16,400 ft. (5 000 m).

The M-64 engine is a 9-cylinder air-cooled radial which was developed from the M-25—the Soviet equivalent of the American Wright Cyclone 9. It has a 2-speed supercharger and it is rated at 1,000 h.p. at take-off and at 13,100 ft. (4 000 m).

The M-82 engine is a new 14-cylinder air-cooled radial which is now in production. It has a 2-speed supercharger and it is rated at 1,600 h.p. at take-off with a military rating of 1,300 h.p. at 13,100 ft. (4 000 m).

The M-88 engine is a 14-cylinder air-cooled radial which was developed from the M-85—the Soviet equivalent of the French Gnome-Rhone 14N. It has a 2-speed supercharger and it is rated at 1,100 h.p. at takeoff with a military rating of 1,000 h.p. at 15,400 ft. (4 700 m).

The M-105 engine is a 12-cylinder liquid-cooled vee-type power plant which was developed from the M-100—the Soviet equivalent of the French Hispano-Suiza 12Y. The M-105P has a hollow propeller shaft for a cannon. It is equipped with a 2-speed supercharger and it is rated at 1,100 h.p. at take-off with a military rating of 1,050 h.p. at 13,100 ft. (4 000 m). The M-105R is similar to the M-105P, except that it is not equipped for a cannon. The latest engine of the series is the M-107 which is rated at 1,200 h.p. at take-off with a military rating of 1,100 h.p. at 16,400 ft. (5 000 m).

STANDARDIZED DATA PAGES

Standardized data pages are used to present the basic aircraft engines and the basic airborne auxiliary power plants described and illustrated in the following sections of the book. The arrangement of the data on the standardized data pages is as follows: First, there is a concise description of the engine, its construction and the major accessories with which it is equipped. Then, in tabular form, there are items such as bore, stroke, displacement (swept volume), compression ratio, overall dimensions, frontal area, total weight and weight per maximum horsepower.

Fuel and lubricating oil consumptions at cruising output are given in units of weight. The fuel grade and the viscosity of the lubricating oil at 210° F. (100° C) also are specified.

Efficiency figures such as maximum power output per unit of displacement, maximum power output per unit of piston area, maximum piston speed and maximum brake mean effective pressure have been calculated for comparative purposes.

Finally, the various horsepower rating are given such as:

Take-off rating, or the maximum horsepower which it is permissible to take from the engine at ground level and at low altitudes.

Military (combat) rating, or the maximum horsepower within limits of safety which it is permissible to use for military purposes—usually equal to the take-off rating.

Normal rating, or the maximum horsepower which the engine can deliver continuously without undue stress.

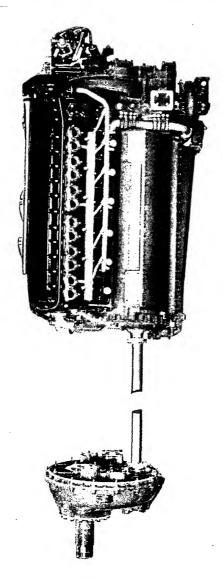
Cruising rating, or the maximum horsepower recommended for continuous operation consistent with reasonable fuel economy.

In the case of airborne auxiliary power plants, both the engine ratings and the electric generator outputs are given.

The status of the data on the standardized pages can be seen from the notation at the top of the page to the left of the country of origin. New denotes completely new data. Revised indicates major revisions. Unmarked pages have minor changes.

The engine tabulations at the back of the book include all of the basic engines presented in the standardized pages together with many others which cannot be set up in standardized page form due to lack of sufficient information.





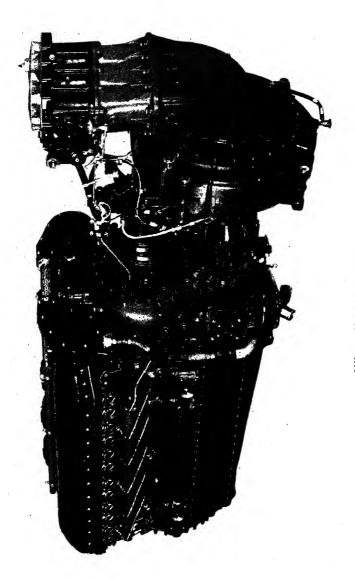
Allison V-1710-E (1-stage)

Model V-1710-E19 (-85).				
Type 12 cylinders, wee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.				
sisting of 6 steel cylinder barre alloy head with an aluminum the head and to each of the 6 be assembly attached to crankcase through head. 2 inlet valves cooled) per cylinder actuated 1-piece counterbalanced cranks ings. Spur reduction gear, ratio extension drive shaft from engannon.	onstruction 2-piece aluminum alloy crankcase. 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.45:1, in remote gear box with extension drive shaft from engine. Hollow propeller shaft for			
SuperchargerGear-driven 1-speed supercharger, ratio 9.60:1.				
Carburation 1 Bendix-Stromberg PD-12K6 2-barrel injection type downdraft carburetor with automatic mixture control.				
Ignition	al magneto and 2 12-point dis- park plugs per cylinder. Shielded			
Lubrication Pressure feed, 60-70 lb./sq.in.	$(4,2-4,9 \text{ kg/m}^2)$. Dry sump.			
Starter Eclipse 915 inertia and direct c	ranking electric starter.			
Bore	140 mm 152 mm 28,0 lit 6,65:1 745 mm 955 mm 4 932 mm 0,27 m² 655 kg 0,54 kg/hp 255 g/hp/hr 11 g/hp/hr 100/130 grade 20,5 - 25,1 cs 42,9 hp/lit 0,65 hp/cm² 15,2 m/sec 13,0 kg/cm²			
Rating (take-off) 1,200 h.p./3,000 r.p.m./51.5 in. (1 308 mm) Hg. boost Rating (military) 1,125 h.p./3,000 r.p.m./15,500 ft. (4 700 m) Rating (normal) 1,000 h.p./2,600 r.p.m./14,000 ft. (4 300 m) Rating (max. cruising) 750 h.p./2,300 r.p.m./14,000 ft. (4 300 m)				
Note 1: This length includes extension drive shaft ler shaft. Length of engine alone is 69.9 in. (1 776	, reduction gear box and propel-			

Note 2: This weight includes extension drive shaft, reduction gear box and propeller shaft. Weight of engine alone is 1,210 lb. (549 kg).

V-1710-E18 (-83): Same as V-1710-E19. Reduction gear ratio 0.50:1.

Additional models of Allison V-1710-E engines will be found on page 79.

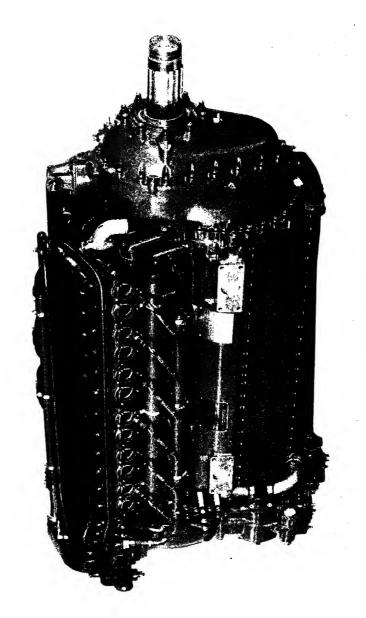


Allison V-1710-E (2-stage)

		•	
Model	V-1710-E11 (-93).		
Type	.12 cylinders, vee 60 degrees, drive, supercharged, 4-cycle.	ethylene glycol cooled, geared	
Construction	2-piece aluminum alloy crankcase, 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.45:1, in remote gear box with extension drive shaft from engine. Hollow propeller shaft for cannon.		
Supercharger	percharger Gear-driven variable speed 2-stage supercharger. First stage in separate auxiliary unit, impeller ratio 6.85:1, with hydraulic coupling and automatic speed control regulated by air intake pressure. Second stage integral with engine, impeller ratio 8.1:1.		
Carburation	.1 Bendix-Stromberg PT-13E9 3- carburetor mounted on auxiliary injection onto second-stage impe	supercharger unit. Direct fuel	
Ignition	.1 Bendix-Scintilla DFLN-6 dua tributors. 2 18-mm long reach sp charged shielded ignition system	park plugs per cylinder. Super-	
Lubrication	. Pressure feed, 60-70 lb./sq.in. (4,6 - 4,9 kg/cm ²). Dry sump.	
	. Jack & Heintz JH-5L electric in	ertia starter.	
Compression ratio. Width Height Length (see Note Frontal area (gear Weight (see Note Weight/horsepower Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		140 mm 152 mm 28,0 lit 6,65:1 745 mm 955 mm 4 932 mm 0,27 m² 651 kg 0,49 kg/hp 230 g/hp/hr 11 g/hp/hr 1100/130 grade 20,5 - 25,1 cs 47,3 hp/lit 0,72 hp/cm² 15,2 m/sec 14,3 kg/cm²	
Rating (take-off)			
1000 1. This length menues extension unive shart, reduction geal nox, properties			

Note 1: This length includes extension drive shaft, reduction gear box, propeller shaft and auxiliary supercharger unit. Length of engine alone is 69.9 in. (1776 mm).

Note 2: This weight includes extension drive shaft, reduction gear box, propeller shaft and auxiliary supercharger unit. Weight of engine alone is $1,220~{\rm lb}$. (553 kg).

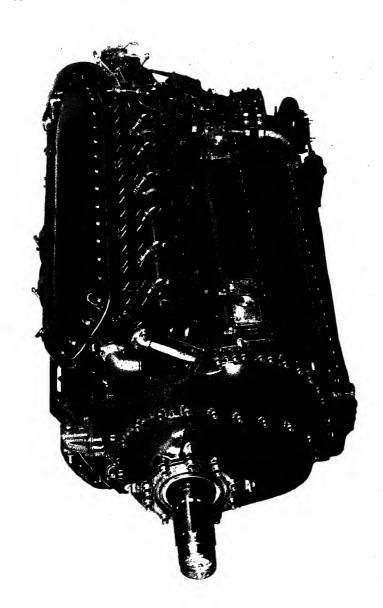


Allison V-1710-F

Model V-1710-F17R (-89). Type 12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle. Construction 2-piece aluminum alloy crankcase. 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jucket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft, 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.50:1. Supercharger Gear-driven 1-speed supercharger, ratio 8.1:1. General Electric turbo-supercharger with intercooler. Carburation 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Scintilla DFLN-6 dual magneto and 2 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system. Lubrication Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/cm²). Dry sump. Starter Eclipse 915 inertia and direct cranking electric starter. Bore 5.50 in. 140 mm Stroke 6.00 in. 152 mm Displacement 1,710 cu.in. 28,0 lit Compression ratio 6.65:1 6,65:1 Width 29,3 in. 745 mm Height 36.7 in. 932 mm Length 36.6 in. 2 174 mm Frontal area 6.1 sq.ft. 0.57 m² Weight/horsepower 0.94 lb./hp., 235 g/hp/hr Oil consumption (cr.) 0.52 lb./hp./hr. 235 g/hp/hr Oil consumption (cr.) 0.52 lb./hp./hr. 235 g/hp/hr Oil consumption (cr.) 0.52 lb./hp./hr. 11 g/hp/hr Gasoline grade 100/130 grade 100/130 grade Oil grade (viscosity) 1,425 hp./sq.im. 0.78 hp/cm² Piston speed (max.) 3,000 ft./min. 15.2 m/sec B.m.e.p. (max.) 219 lb./sq.in. 15.4 kg/cm² Rating (miliary) 1,425 hp./3,00				
drive, supercharged, 4-cycle. Construction 2-piece aluminum alloy crankcase. 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jucket attached to the head and to each of the 6 barrels. Each head-cylinder jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead canshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain hearings. Spur reduction gear, ratio 0.50:1. Supercharger Gear-driven 1-speed supercharger, ratio 8.1:1. General Electric turbo-supercharger with intercooler. Carburation 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Scintilla DFLN-6 dual magneto and 2 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system. Lubrication Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/cm²). Dry sump. Starter Eclipse 915 inertia and direct cranking electric starter. Bore 5.50 in. 140 mm Stroke 6.00 in. 152 mm Displacement 1,710 cu.in. 28,0 lit Compression ratio 6.65:1 6,65:1 Width 29.3 in. 745 mm Height 36.7 in. 932 mm Length 85.6 in. 2 174 mm Frontal area 6.1 sq.ft. 0.57 m² Weight 1,350 lb. 612 kg Weight 1,350 lb. 612 kg Weight/horsepower 0.94 lb./h.p./hr. 235 g/hp/hr Oil consumption (cr.) 0.025 lb./h.p./hr. 235 g/hp/hr Oil consumption (cr.) 0.025 lb./h.p./hr. 235 g/hp/hr Oil consumption (cr.) 0.025 lb./h.p./hr. 11 g/hp/hr Gasoline grade 100/130 gra	Model	V-1710-F17R (-89).		
sisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.50:1. Supercharger Gear-driven 1-speed supercharger, ratio 8.1:1. General Electric turbo-supercharger with intercooler. Carburation 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with intercooler. Carburation 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with intercooler. Liputure control 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with intercooler. Liputure control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with intercooler. Liputure control. Ignition 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with intercooler. Lubrical mixture control. Ignition 1 Bendix-Strom	Type	.12 cylinders, vee 60 degrees, drive, supercharged, 4-cycle.	ethylene glycol cooled, geared	
turbo-supercharger with intercooler. Carburation 1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control. Ignition 1 Bendix-Scintilla DFLN-6 dual magneto and 2 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system. Lubrication Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/cm²). Dry sump. Starter Eclipse 915 inertia and direct cranking electric starter. Bore 5.50 in. 140 mm Stroke 6.00 in. 152 mm Displacement 1,710 cu.in. 28,0 lit Compression ratio 6.65:1 6,65:1 Width 29.3 in. 745 mm Height 36.7 in. 932 mm Length 85.6 in. 2 174 mm Frontal area 6.1 sq.ft. 0.57 m² Weight 1,350 lb. 612 kg Weight/horsepower 0.94 lb./h.p. 0,43 kg/hp Fuel consumption (cr.) 0.025 lb./h.p./hr. 235 g/hp/hr Oil consumption (cr.) 0.025 lb./h.p./hr. 11 g/hp/hr Gasoline grade 100/130 grade	Construction	2-piece aluminum alloy crankcase. 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead canishaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain		
Ignition	Supercharger			
tributors. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system. Lubrication Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/cm²). Dry sump. Starter Eclipse 915 inertia and direct cranking electric starter. Bore	Carburation	1 Bendix-Stromberg PD-12K7 2-barrel injection type downdraft carburetor with automatic mixture control.		
Starter	Ignition	tributors. 2 18-mm long reach spark plugs per cylinder. Shielded		
Bore .5.50 in. 140 mm Stroke 6.00 in. 152 mm Displacement 1,710 cu.in. 28,0 lit Compression ratio 6.65:1 6,65:1 Width 29.3 in. 745 mm Height 36.7 in. 932 mm Length 85.6 in. 2 174 mm Frontal area 6.1 sq.ft. 0,57 m² Weight 1,350 lb. 612 kg Weight/horsepower 0.94 lb./h.p. 0,43 kg/hp Fuel consumption (cr.) 0.52 lb./h.p./hr. 235 g/hp/hr Oil consumption (cr.) 0.025 lb./h.p./hr. 11 g/hp/hr Gasoline grade 100/130 grade 100/130 grade Oil grade (viscosity) 100-120 S.U. secs. 20,5 - 25.1 cs Output/displacement 0.83 h.p./cu.in. 50.9 hp/lit Output/piston area 5.04 h.p./sq.in. 0,78 hp/cm² Piston speed (max.) 3,000 ft./min. 15.2 m/sec B.m.e.p. (max.) 219 lb./sq.in. 15,4 kg/cm² Rating (take-off) 1,425 h.p./3,000 r.p.m./27,000 ft. (8 200 m) <td>Lubrication</td> <td>Pressure feed, 60-70 lb./sq.in. (</td> <td>$(4,2-4,9 \text{ kg/cm}^2)$. Dry sump.</td>	Lubrication	Pressure feed, 60-70 lb./sq.in. ($(4,2-4,9 \text{ kg/cm}^2)$. Dry sump.	
Stroke 6.00 in. 152 mm Displacement 1,710 cu.in. 28,0 lit Compression ratio 6.65:1 6,65:1 Width .29,3 in. 745 mm Height .36.7 in. 932 mm Length .85.6 in. 2 174 mm Frontal area .6.1 sq.ft. 0,57 m² Weight .1,350 lb. .612 kg Weight/horsepower .0.94 lb./h.p./hr. .235 g/hp/hr Oil consumption (cr.) .0.52 lb./h.p./hr. .235 g/hp/hr Oil consumption (cr.) .0.025 lb./h.p./hr. .11 g/hp/hr Gasoline grade .100/130 grade .100/130 grade Oil grade (viscosity) .100-120 S.U. secs. .20,5 - 25.1 cs Output/displacement .0.83 h.p./cu.in. .50.9 hp/lit Output/piston area .5.04 h.p./sq.in. .50.9 hp/cm² Piston speed (max.) .3.000 ft./min. .15.2 m/sec B.m.e.p. (max.) .219 lb./sq.in. .15,4 kg/cm² Rating (take-off) .1,425 h.p./3,000 r.p.m./27,000 ft. (8 200 m) Rating (military) .1,4	Starter	Eclipse 915 inertia and direct cr	anking electric starter.	
Rating (military)1,425 h.p./3,000 r.p.m./27,000 ft. (8 200 m) Rating (normal)1,100 h.p./2,600 r.p.m./27,000 ft. (8 200 m) Rating (max. cruising)825 h.p./2,300 r.p.m./27,000 ft. (8 200 m)	Stroke Displacement Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption (o Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max.		152 mm 28,0 lit 6,65:1 745 mm 932 mm 2 174 mm 0,57 m ² 612 kg 0,43 kg/hp 235 g/hp/hr 11 g/hp/hr 1100/130 grade 20,5 - 25.1 cs 50.9 hp/lit 0,78 hp/cm ² 15,2 m/sec	
V-1710-F171 (-91): Same as V-1710-F17R Propeller shaft rotates in apposite				

V-1710-F17L (-91): Same as V-1710-F17R. Propeller shaft rotates in opposite direction.

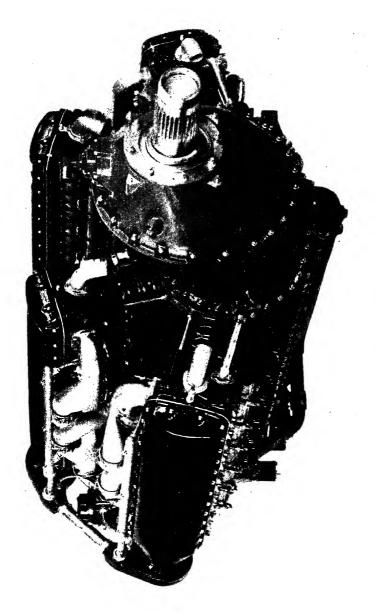
Additional models of Allison V-1710-F engines will be found on page 79.



Allison V-1710-F

Model	
Type	ylene glycol cooled, geared drive,
Construction 2-piece aluminum alloy crankcase. 2 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.50:1.	
Supercharger Gear-driven 1-speed supercharg turbo-supercharger with interco	
Carburation 1 Bendix-Stromberg PD-12K8 2 carburetor with automatic mix	
Ignition	spark plugs per cylinder. Super-
Lubrication Pressure feed, 60-70 lb./sq.in.	(4,2-4,9 kg/cm ²). Dry sump.
Starter Eclipse 915 inertia and direct of	cranking electric starter.
Bore	140 mm 152 mm 28,0 lit 6,65:1 745 mm 955 mm 2 179 mm 0,57 m² 633 kg 0,43 kg/hp 245 g/hp/hr 11 g/hp/hr 11 g/hp/hr 100/130 grade 20,5 - 25,1 cs 52,7 hp/lit 0,80 hp/cm² 15,2 m/sec 16,0 kg/cm²
Rating (take-off)	0,000 ft. (9 100 m) 0,000 ft. (9 100 m)

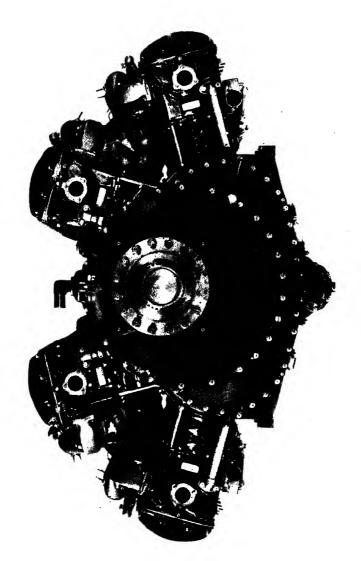
V-1710-F30L (-113): Same as V-1710-F30R. Propeller shaft rotates in opposite direction.



Allison V-3420-A

Model		
Type24 cylinders, 2 vee 60 degrees groups with 30 degrees angle between them, ethylene glycol cooled, geared drive, supercharged, 4-cycle.		
Construction 3-piece aluminum alloy crankcase with magnesium alloy sump. 4 cylinder blocks each consisting of 6 steel cylinder barrels shrunk in a 1-piece aluminum alloy head with an aluminum alloy coolant jacket attached to the head and to each of the 6 barrels. Each head-cylinder-jacket assembly attached to crankcase by 14 long stud bolts extending through head. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 2 6-throw 1-piece counterbalanced crankshafts supported in 7 plain bearings. Spur reduction gear, ratio 0.32:1.		
Supercharger Gear-driven I-speed supercharge turbo-supercharger with intercon		
Carburation 1 Bendix-Stromberg PR-58B3 3-barrel injection type downdraft carburetor with automatic mixture control.		
Ignition 2 Bendix-Scintilla DFLN-6 dual magnetos and 4 12-point distributors. 2 18-mm long reach spark plugs per cylinder. Supercharged shielded ignition system.		
Lubrication Pressure feed, 60-70 lb./sq.in. (4	4,2-4,9 kg/cm ²). Dry sump.	
Starter Jack & Heintz JH-5EL electric	inertia starter.	
Bore	140 mm 152 mm 56,0 lit 6,65:1 1 524 mm 963 mm 2 436 mm 1,08 m² 1 204 kg 0,46 kg/hp 225 g/hp/hr 11 g/hp/hr 11 g/hp/hr 100/130 grade 20,5 -25,1 cs 46,4 hp/lit 0,71 hp/cm² 15,2 m/sec 14,1 kg/cm²	
Rating (take-off)2,600 h.p./3,000 r.p.m./46 Rating (military)2,600 h.p./3,000 r.p.m./25 Rating (normal)2,100 h.p./2,600 r.p.m./25 Rating (max. cruising)1,575 h.p./2,300 r.p.m./25	,000 ft. (7 600 m) .000 ft. (7 600 m) ,000 ft. (7 600 m)	

V-3420-A16L (13): Similar to V-3420-A16R, but propeller shaft rotates in opposite direction. Gear-driven 1-speed supercharger, ratio 6.82:1. General Electric turbo-supercharger with intercooler.



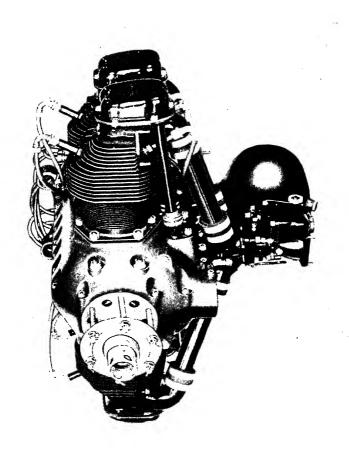
Additional Models of Allison V-1710-E Engines (1-stage) (Continued from page 69)

- V-1710-E4 (-35): 1,150 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./12,000 ft. (3 700 m) military rating; 1,000 h.p./2,600 r.p.m./10,800 ft. (3 300 m) normal rating. Reduction gear ratio 0.55:1. 1-speed supercharger, ratio 8.80:1. 100/130 grade gasoline.
- V-1710-E6 (-63): 1,325 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./12,000 ft. (3 700 m) military rating; 1,000 h.p./2,600 r.p.m./10,800 ft. (3 300 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 8.80:1. 100/130 grade gasoline.

Additional Models of Allison V-1710-F Engines

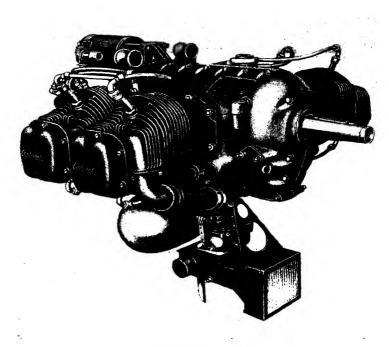
(Continued from page 73)

- V-1710-F2R (·27), -F2L (·29): 1,150 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./25,000 ft. (7 600 m) military rating; 1,000 h.p./2,600 r.p.m./25,000 ft. (7 600 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 6.44:1. General Electric turbo-supercharger. 100/130 grade gasoline.
- V-1710-F3R (-39): 1,150 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./12,000 ft. (3 700 m) military rating; 1,000 h.p./2,600 r.p.m./10,800 ft. (3 300 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 8.80:1. 100/130 grade gasoline.
- V-1710-F4R (-73): 1,325 h.p./3,000 r.p.m./take-off; 1,150 h.p./3,000 r.p.m./12,000 ft. (3 700 m) military rating; 1,000 h.p./2,600 r.p.m./10,800 ft. (3 300 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 8.80:1. 100/130 grade gasoline.
- V-1710-F5R (-49), -F5L (-53): 1,325 h.p./3,000 r.p.m./take-off; 1,325 h.p./3,000 r.p.m./25,000 ft. (7 600 m) military rating; 1,000 h.p./2,600 r.p.m./25,000 ft. (7 600 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 7.48:1. General Electric turbo-supercharger. 100/130 grade gasoline.
- V-1710-F10R (-51), -F10L (-55): Similar to V-1710-F5R, -F5L.
- V-1710-F20R (-81): 1,200 h.p./3,000 r.p.m./take-off; 1,125 h.p./3,000 r.p.m./15,500 ft. (4 700 m) military rating; 1,000 h.p./2,600 r.p.m./14,000 ft. (4 300 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 9.60:1. 100/130 grade gasoline.
- V-1710-F26R (-99): 1,200 h.p./3,000 r.p.m./take-off; 1,125 h.p./3,000 r.p.m./15,500 ft. (4 700 m) military rating; 955 h.p./2,600 r.p.m./15,700 ft. (4 800 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 9.60:1. 100/130 grade gasoline.
- V-1710-F21R (-87): 1,325 h.p./3,000 r.p.m./take-off; 1,325 h.p./3,000 r.p.m./3,000 ft. (900 m) military rating; 1,100 h.p./2,600 r.p.m./2,500 ft. (800 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 7.48:1. 100/130 grade gasoline.



Continental A-65

Model	. A-65-8.	
Type	.4 cylinders, horizontally oppose supercharged, 4-cycle. A.T.C. 20	ed, air cooled, direct drive, not 05.
Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrel and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 2-throw 1-piece crankshaft supported in 3 plain bearings.		
Supercharger	. None.	
Carburation	.1 Bendix-Stromberg NA-S3A1 ${\bf u}$	pdraft carburetor.
Ignition	.2 Bendix-Scintilla SF4RN-8 m spark plugs per cylinder. Shield	agnetos. 2 18 mm short reach led ignition system.
Lubrication	Pressure feed, 35 lb./sq.in. (2,5	kg/cm ²). Wet sump.
Starter	None.	
Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max. B.m.e.p. (max.)		98 mm 92 mm 2,8 lit 6,3:1 800 mm 516 mm 772 mm 0,25 m² 79 kg 1,23 kg/hp 225 g/hp/hr 4 g/hp/hr 73 octane 15,6 cs 23,2 hp/lit 0,21 hp/cm² 7,0 m/sec 9,2 kg/cm²
Rating (take-off)		
A-50-8, A-50-9:	50 h.p./1,900 r.p.m./take-off an Direct drive. Not supercharged.	nd normal rating at sea level. 73-octane gasoline. A.T.C. 190.
A-65-9:	Same as A-65-8. A.T.C. 205.	
A-75-8, A-75-9:	75 h.p./2,600 r.p.m./take-off at Direct drive. Not supercharged.	nd normal rating at sea level. 73-octane gasoline. A.T.C. 213.
A-80-8, A-80-9:	80 h.p./2,700 r.p.m./take-off an Direct drive. Not supercharged.	nd normal rating at sea level. 80-octane gasoline. A.T.C. 217.



Continental C-75

Model

Continental C-75

Middel	0-10-121					
Туре	4 cylinders, supercharge	horizontally d, 4-cycle. A.	opposed, a T.C. 233.	ir cooled,	direct drive,	not

Construction2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 2-throw 1-piece crankshaft supported in 3 plain bearings.

Supercharger None.

Carburation 1 Bendix-Stromberg NA-S3A1 updraft carburetor.

Ignition 2 Bendix-Scintilla SF4RN-8 magnetos. 2 18-mm short reach

spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 35 lb./sq.in. (2,5 kg/cm²). Wet sump.

Starter Delco-Remy 30112 electric starter.

C-75-12

Bore4.0625 in.	103 mm
Stroke	92 mm
Displacement 188 cu.in.	3,1 lit
Compression ratio6.3:1	6,3:1
Width	802 mm
Height	538 mm
Length	800 mm
Frontal area2.7 sq.ft.	$0,25 \text{ m}^2$
Weight	84 kg
Weight/horsepower2.48 lb./h.p.	1,12 kg/hp
Fuel consumption (cr.) 0.56 lb./h.p./hr.	255 g/hp/hr
Oil consumption (cr.) 0.010 lb./h.p./hr.	4,5 g/hp/hr
Gasoline grade73 octane	73 octane
Oil grade (viscosity)80 S.U. secs.	15,6 cs
Output/displacement0.40 h.p./cu.in.	24,2 hp/lit
Output/piston area1.45 h.p./sq.in.	0.23 hp/cm^2
Piston speed (max.)2,719 ft./min.	6.9 m/sec
B.m.e.p. (max.)141 lb./sq.in.	9.9 kg/cm^2

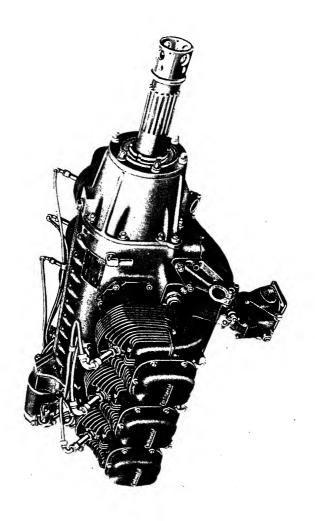
Rating (take-off)75 h.p./2,250 r.p.m.

C-75-10: Same as C-75-12. No starter. A.T.C. pending.

C-75-11: Same as C-75-12. Hummer electric starter. A.T.C. pending.

C-85-12: 85 h.p./2,550 r.p.m./take-off and normal rating at sea level.

Direct drive. Not supercharged. A.T.C. pending.



Continental C-140

Type	.6 cylinders, horizontally oppos not supercharged, 4-cycle. A.T.	
Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 3 plain bearings. Planetary reduction gear, ratio 0.62:1.		
Supercharger	. None.	
Carburation	.1 Bendix-Stromberg NA-R4B up	draft carburetor.
Ignition		
Lubrication Pressure feed, 40 lb./sq.in. (2,8 kg/cm ²). Wet sump.		
Starter Delco-Remy 41186 electric starter.		
Bore	3.625 in282 cu.in6.3:131.5 in.	103 mm 92 mm 4,6 lit 6,3:1 800 mm
Height Length		628 mm 1 186 mm
Luigui		0.05 . 9

Weight/horsepower 2.13 lb./h.p. Fuel consumption (cr.) ... 0.55 lb./h.p./hr. Oil consumption (cr.)0.017 lb./h.p./hr.

Frontal area2.7 sq.ft. Weight298 lb.

1 186 mm 0,25 m² 135 kg 0,97 kg/hp 250 g/hp/hr 8 g/hp/hr 8 g/hp/hr 73 octane 15,6 cs 30,4 hp/lit 0,28 hp/cm² 9,2 m/sec 9,1 kg/cm²

Rating (take-off)140 h.p./3,000 r.p.m.

Rating (normal) ... 140 h.p./3,000 r.p.m./sea level Rating (cruising) ... 102 h.p./2,700 r.p.m./sea level

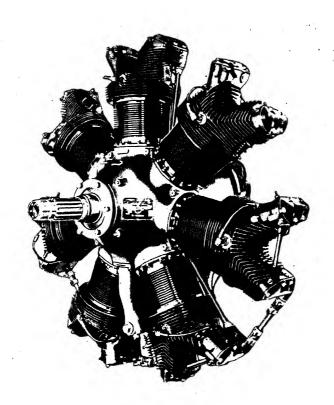
C-115-1:

115 h.p./2,350 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. pending.

C-125-1:

Similar to C-115-1, 125 h.p./2,580 r.p.m./take-off and normal

rating at sea level. A.T.C. pending.



Continental W-670

Continental W-670

Model		
Type	r cooled, direct drive, not super-	
Construction2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 ball bearings.		
SuperchargerNone.		
Carburation 1 Bendix-Stromberg NA-R6	updraft carburetor.	
Ignition		
Lubrication Pressure feed, 70-80 lb./sq.ir	n. (4,9-5,6 kg/cm ²). Dry sump.	
Starter Eclipse E-160 direct cranking	g electric starter.	
Bore	130 mm 117 mm 10,9 lit 6,1:1 1 072 mm 869 mm 0,90 m ² 204 kg 0,84 kg/hp 220 g/hp/hr 11 g/hp/hr 11 g/hp/hr 80 octane 10,3 - 25,1 cs 22,0 hp/lit 0,26 hp/cm ² 8,6 m/sec 9,1 kg/cm ²	
Rating (take-off) .240 h.p./2,200 r.p.m. Rating (normal) .240 h.p./2,200 r.p.m./s Rating (cruising) .202 h.p./2,075 r.p.m./s	sea level sea level	
14/ CTO CA /D CTO E) - 200 1 /0 OFF /: 1	or 1 1 1 .1	

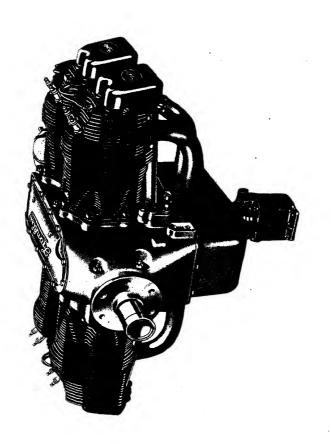
W-670-6A (R-670-5): 220 h.p./2,075 r.p.m./take-off and normal rating at sea level.

Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 162.

W-670-K: 225 h.p./2,175 r.p.m./take-off and normal rating at sea level. Direct drive, Not supercharged, 73-octane gasoline, A.T.C. 162.

W-670-N (R-670-4): Same as W-670-6A. Military engine.



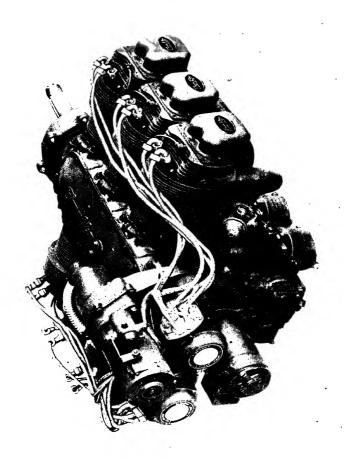


Franklin 4AC-176

Model	•	
Type4 cylinders, horizontally oppose supercharged, 4-cycle. A.T.C. 22	ed, air cooled, direct drive, not	
Construction2-piece aluminum alloy crankcase divided vertically. Cylinders with nickel-iron barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 3 plain bearings.		
Supercharger None.		
Carburation 1 Marvel-Schebler MA-3P updra	aft carburetor.	
Ignition 2 Eisemann AM-4 or LA-4 m spark plugs per cylinder.	nagnetos. 2 14-mm short reach	
Lubrication Pressure feed, 35-45 lb./sq.in.	(2,5 - 3,2 kg/cm ²). Wet sump.	
Starter None.		
Bore	102 mm 89 mm 2,9 lit 6,0:1 767 mm 508 mm 726 mm 0,21 m ² 83 kg 1,28 kg/hp 220 g/hp/hr 1,4 g/hp/hr 73 octane 4,3 cs 22,4 hp/lit 0,20 hp/cm ² 6,8 m/sec 8,9 kg/cm ²	
Rating (take-off)	level level	
	~ . ~	

4AC-176-BA3: Same as 4AC-176-BA2. Auto-Lite or Delco-Remy electric starter and generator. A.T.C. 221.

Manufactured by Aircooled Motors Corporation.

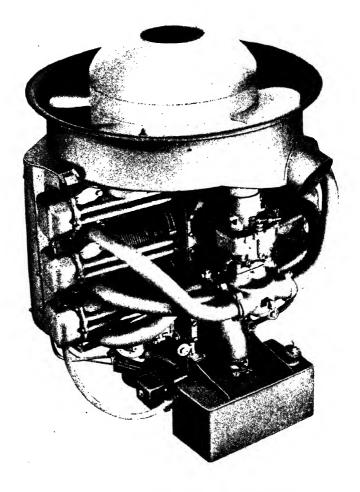


Franklin 6AC-298

Model	.6ACG-298-H3.	
Type	6 cylinders, horizontally oppose supercharged, 4-cycle. A.T.C. pe	d, air cooled, geared drive, not ending.
Construction	Construction2-piece aluminum alloy crankcase divided vertically. Cylinders with nickel-iron barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 4 plain bearings. Planetary reduction gear, ratio 0.63:1.	
Supercharger	. None.	
Carburation	.2 Marvel-Schebler MA-3A updra	aft carburetors.
Ignition 2 Eisemann LA-6 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication	.Pressure feed, 35-45 lb./sq.in.	$(2,5 \cdot 3,2 \text{ kg/cm}^2)$. Wet sump.
Starter	Auto-Lite or Delco-Remy electri	c starter.
Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosi Output/displaceme Output/piston area Piston speed (max B.m.e.p (max.)	3.50 in. 298 cu.in. 7.0:1 30.2 in. 24.6 in. 43.7 in. 2.8 sq.ft. 340 lb. r 2.06 lb./h.p. (cr.) 0.48 lb./h.p./hr. cr.) 0.003 lb./h.p./hr. er. 2.0 ctu. 80 octane y) 40 S.U. secs. int 0.54 h.p./cu.in. 1.88 h.p./sq.in. 1,487 ft./min. 134 lb./sq.in.	108 mm 89 mm 4,9 lit 7,0:1 767 mm 625 mm 1 110 mm 0,26 m ² 154 kg 0,93 kg/hp 215 g/hp/hr 1,4 g/hp/hr 80 octane 4,3 cs 32.6 hp/lit 0,29 hp/cm ² 9,5 m/sec 9,4 kg/cm ²
Rating (normal)		level .

6AC-298-F3: 130 h.p./2,550 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 80-octane gasoline. A.T.C. 225.

Manufactured by Aircooled Motors Corporation.



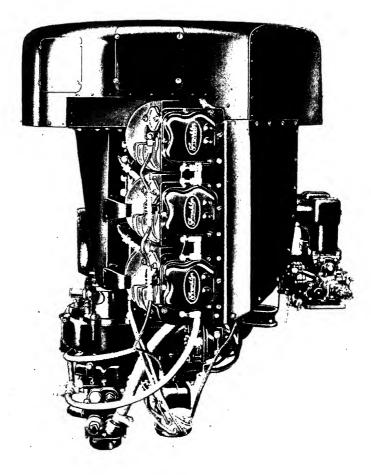
Franklin 6ACV-298 (Helicopter)

Franklin 6ACV-298 (Helicopter)

Model	.6ACV-298.	
Type	.6 cylinders, horizontally oppose supercharged, 4-cycle. A.T.C. pe	d, air cooled, direct drive, not
Construction	Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with nickel-iron barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 4 plain bearings. 6-blade fan on top of engine driven at crankshaft speed for cooling purposes.	
Supercharger	.None.	
Carburation	.1 Bendix-Stromberg AAV-2 do	wndraft carburetor.
Ignition	2 Eisemann LA-6 magnetos. 2 per cylinder. Shielded ignition	
Lubrication	.Pressure feed, 35-45 lb./sq.in. ((2,5-3,2 kg/cm ²). Dry sump.
Starter	.Auto-Lite or Delco-Remy electric	c starter.
Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosi Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		108 mm 89 mm 4,9 lit 7,0:1 777 mm 684 mm 927 mm 142 kg 0,89 kg/hp 235 g/hp/hr 5 g/hp/hr 80 octane 25,1 cs 32,6 hp/lit 0,29 hp/cm² 9,6 m/sec 9,3 kg/cm²
Rating (normal)		level level

Note: This engine is designed for vertical installation in helicopters.

Manufactured by Aircooled Motors Corporation.

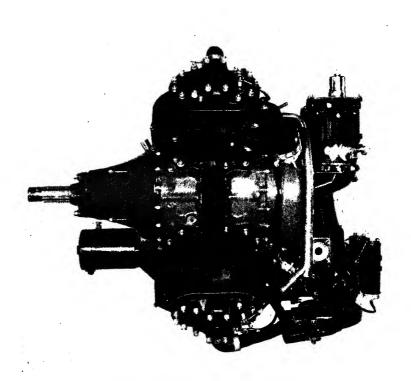


Franklin 6ACV-403 (Helicopter)

Franklin 6ACV-403 (Helicopter)

Model 6ACV-403.		
Type 6 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. Approved by A.A.F.		
Construction2-piece aluminum alloy crankcase divided vertically. Cylinders with nickel-iron barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 4 plain bearings. 6-blade fan on top of engine driven at crankshaft speed for cooling purposes.		
Supercharger None.		
Carburation 2 Bendix-Stromberg PS-5C p	ressure type updraft carburetors.	
Ignition 2 Eisemann LA-6 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication Pressure feed, 45-60 lb./sq.in	n. $(3.0 - 4.2 \text{ kg/cm}^2)$. Dry sump.	
Starter Delco-Remy 108567-541 vertic	cal geared electric starter.	
Bore	117 mm 102 mm 6,6 lit 7,0:1 843 mm 856 mm 1 102 mm 208 kg 0,85 kg/hp 225 g/hp/hr 7 g/hp/hr 80 octane 25,1 cs 37,1 hp/lit 0,37 hp/cm² 11,1 m/sec 10,3 kg/cm²	
Rating (take-off) 245 h.p./3,275 r.p.m. Rating (normal) 245 h.p./3,275 r.p.m./ Rating (cruising) 190 h.p./3,050 r.p.m./	sea level sea level	

Note: This engine is designed for vertical installation in helicopters. Manufactured by Aircooled Motors Corporation.

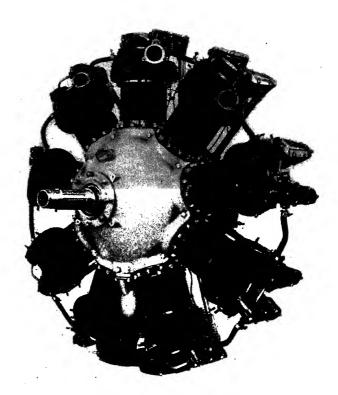


General Motors Research X-250

General Motors Research X-250

Model	
Type	quid cooled, direct drive, ground
Constructionl-piece barrel type aluminum alle cylinder blocks each containing 2 combustion chamber. Steel cylinder block personal combustion chamber block. Personal contains around bottom of l-piece crankshaft supported in bearing. 8 slipper type connections.	2 cylinder bores with a common der liners. Detachable cylinder liston-controlled inlet ports and f each cylinder block. 2-throw 2 plain bearings and 1 thrust
SuperchargerGear-driven ground blower for s	scavenging, ratio 8.37:1.
Carburation 1 General Motors Research dov	wndraft carburetor.
Ignition	
Lubrication Presure feed, 25 lb./sq.in. (1,7 k	g/cm ²). Dry sump.
Starter Delco-Remy electric starter.	
Bore 3.0625 in. Stroke 4.281 in. Displacement 250 cu.in. Compression ratio 7.4:1 Width 27.7 in. Height 31.0 in. Length 41.4 in. Frontal area 6.0 sq.ft. Weight/horsepower 1.37 lb./h.p. Fuel consumption (cr.) 0.58 lb./h.p./hr. Oil consumption (cr.) 0.0025 lb./h.p./hr. Oil consumption (cr.) 0.0025 lb./h.p./hr. Casoline grade 91/96 grade Oil grade (viscosity) 60 S.U. sees. Output/displacement 0.80 h.p./cu.in. Output/piston area 3.39 h.p./sq.in. Piston speed (max.) 1.783 ft./min. B.m.e.p. (max.) 127 lb./sq.in.	78 mm 109 mm 4,1 lit 7,4:1 704 mm 787 mm 1 051 mm 0,56 m ² 125 kg 0,62 kg/hp 265 g/hp/hr 1 g/hp/hr 91/96 grade 10,3 cs 48,8 hp/lit 0,52 hp/cm ² 9,1 m/sec 8,9 kg/cm ²
Rating (take-off) 200 h.p./2,500 r.p.m. Rating (normal) 200 h.p./2,500 r.p.m./sea Rating (cruising) 150 h.p./2,250 r.p.m./sea	level level

Built by Research Laboratories Division of General Motors Corporation.

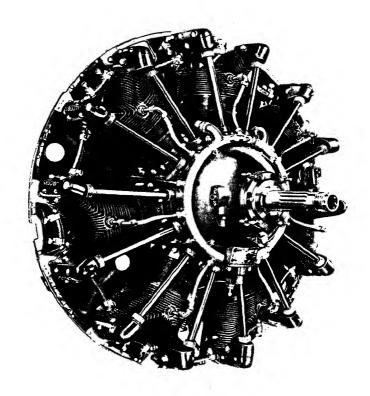


Guiberson A-1020 (Diesel)

Guiberson A-1020 (Diesel)

Model	
Type	
Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.	
SuperchargerNone.	
Injection Direct fuel injection. 1 Guiberson 1-plunger injection pump and 1 Guiberson closed-type 3-orifice injector per cylinder. Injection pressure 2,500 lb./sq.in. (175 kg/cm ²).	
IgnitionCompression.	-
Lubrication Pressure feed, 95 lb./sq.in. (6,7 kg/cm ²). Dry sump.	
Starter Breeze L-4A cartridge starter.	
Bore	130 mm 140 mm 16,7 lit 14,0:1 1 197 mm 980 mm 1,12 m² 296 kg 0,95 kg/hp 170 g/hp/hr 4 g/hp/hr 50-53 cetane 20,5 cs 20,5 hp/lit 0,26 hp/cm² 10,0 m/sec 7,8 kg/cm²
Rating (take-off)	level level

This engine was test-flown in 1940. It is similar to the Guiberson T-1020 Diesel used in United States Army tanks.



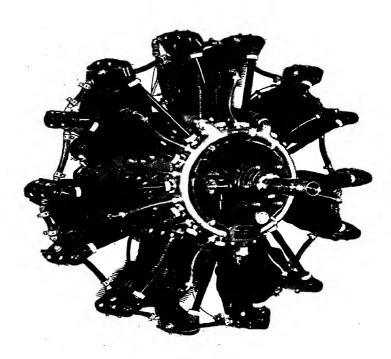
Jacobs R-755

Jacobs R-755

Model	R-755A1 (L-4MB).	
Type	.7 cylinders, 1-row radial, air c charged, 4-cycle.	cooled, direct drive, not super-
Construction	2-piece aluminum alloy crankcas and aluminum alloy heads. 1 inle cylinder actuated by push rods. crankshaft supported in 2 roller	et valve and 1 exhaust valve per 1-throw 2-piece counterbalanced
Supercharger	None.	
Carburation	.1 Bendix-Stromberg NA-R7A up	odraft carburetor.
Ignition	.1 Bendix-Scintilla VMN7-DF5 n WL-7A battery distributor and o plugs per cylinder. Shielded ign	coil. 2 18-mm short reach spark
Lubrication	Pressure feed, 70-90 lb./sq.in. (4,9 - 6,3, kg/cm ²). Dry sump.
Starter	Eclipse E-80 direct cranking ele	ctric starter.
Fuel consumption (Oil consumption (Gasoline grade		133 mm 127 mm 12,4 lit 5,4:1 1 118 mm 1 021 mm 0,98 m² 229 kg 0,93 kg/hp 240 g/hp/hr 7 g/hp/hr 73 octane 20,5 cs 18,1 hp/lit 0,23 hp/cm² 8,5 m/sec 8,3 kg/cm²
Rating (normal)	245 h.p./2,200 r.p.m225 h.p./2,000 r.p.m./sea160 h.p./1,900 r.p.m./sea	level level

Similar to R-755A3. Geared autogiro rotor drive on rear accessory housing. A.T.C. 121. L-4M A7:

R-755A3 (L-4M): Same as R-755A1. 2 magnetos. A.T.C. 121.



Jacobs R-915

Jacobs R-915

Model R-915A1 (L-6MB).

Type 7 cylinders, 1-row radial, air cooled, direct drive, not supercharged, 4-cycle, A.T.C. 195.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. I inlet valve and I exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced

crankshaft supported in 2 roller bearings.

Supercharger.....None.

Carburation 1 Bendix-Stromberg NA-R7A updraft carburetor.

Ignition..........1 Bendix-Scintilla VMN7-DF5 magneto and 1 Bendix-Scintilla WL-7A battery distributor and coil. 2 18-mm short reach spark

plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 70-90 lb./sq.in, (4,9-6,3 kg/cm²). Dry sump.

Starter Eclipse E-80 direct cranking electric starter.

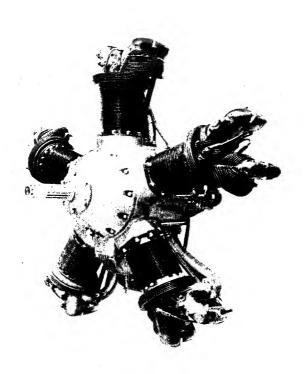
140 mm 140 mm Displacement914 cu.in. 15,0 lit Compression ratio......6.0:1 6.0:1 1 158 mm 1 018 mm 1,06 m² 252 kg Weight/horsepower1.68 lb./h.p. 0,76 kg/hp Fuel consumption (cr.)...0.51 lb./h.p./hr. 230 g/hp/hr Oil consumption (cr.)0.015 lb./h.p./hr. 7 g/hp/hr 80 octane Gasoline grade80 octane Oil grade (viscosity) ... 100 S.U. secs. Output/displacement ... 0.36 h.p./cu.in. Output/piston area ... 1.98 h.p./sq.in. 20,5 cs 22,0 hp/lit 0,31 hp/cm² Piston speed (max.) 2,017 ft./min. 10,1 m/sec B.m.e.p. (max.)130 lb./sq.in. 9.1 kg/cm²

Rating (take-off)330 h.p./2,200 r.p.m.
Rating (normal)300 h.p./2,100 r.p.m./sea level
Rating (cruising)210 h.p./1,900 r.p.m./sea level

R-915A3 (L-6M): Same as R-915A1. 2 magnetos. A.T.C. 195.

R-915A4 (L-6MBA): Similar to R-915A1. Geared autogiro rotor drive on rear accessory housing. A.T.C. 195.

Similar to R-915A3. Geared autogiro rotor drive on rear access-L-6MA: sory housing. A.T.C. 195.



Kinner B-5

Kinner B-5

Model	B-54.		
Type	.5 cylinders, 1-row radial, air c charged, 4-cycle. A.T.C. 51.	cooled, direct drive, not super-	
Construction	on1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings. Splined propeller shaft.		
Supercharger	None.		
Carburation	Carburation 1 Bendix-Stromberg NA-R5A or Holley 419 updraft carburetor.		
Ignition			
Lubrication Pressure feed, 100 lb./sq.in. (7,0 kg/cm ²). Dry sump.			
Starter	Eclipse E-80 direct cranking electrater.	etric starter or Eclipse 390 hand	
Fuel consumption oil consumption (casoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max.		117 mm 133 mm 7,2 lit 5,25:1 1 153 mm 853 mm 1,04 m ² 141 kg 1,13 kg/hp 250 g/hp/hr 7 g/hp/hr 73 octane 20,5 cs 17,3 hp/lit 0,23 hp/cm ² 8,5 m/sec 8,2 kg/cm ²	
Rating (take-off)			

Same as B-54, Tapered propeller shaft, A.T.C. 51.

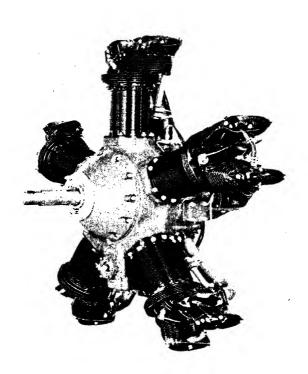
B-5:



Kinner K-5

Kinner K-5

Model	. K-52.	
Type	5 cylinders, 1-row radial, air charged, 4-cycle. A.T.C. 3.	cooled, direct drive, not super-
Construction	11-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings. Tapered propeller shaft.	
Supercharger	. None.	
Carburation	.1 Bendix-Stromberg NA-R5A or	Holley 419 updraft carburetor.
Ignition	.2 Bendix-Scintilla SB5LN-8 m spark plugs per cylinder.	agnetos. 2 18-mm short reach
Lubrication	.Pressure feed, 100 lb./sq.in. (7,	0 kg/cm ²). Dry sump.
Starter	.Eclipse E-80 direct cranking hand starter.	electric starter or Eclipse 390
Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston are Piston speed (ma	5.25 in. 372 cu.in. 5.1:1 45.4 in. 33.0 in. 11.2 sq.ft. 304 lb./h.p. (cr.) 0.55 lb./h.p./hr. cr.) 0.025 lb./h.p./hr.	108 mm 133 mm 6,1 lit 5,1:1 1 153 mm 838 mm 1,04 m ² 138 kg 1,38 kg/hp 250 g/hp/hr 7 g/hp/hr 73 octane 20,5 cs 16,3 hp/lit 0,21 hp/cm ² 8,0 m/sec 8,3 kg/cm ²
Rating (normal)		

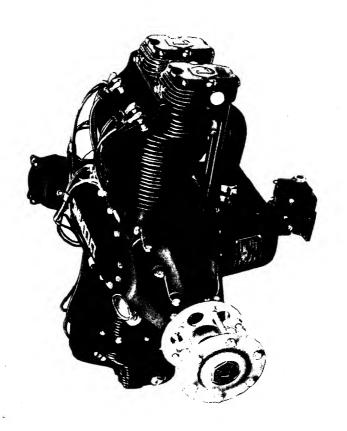


Kinner R-5

Kinner R-5

Model	R-56.		
Type	5 cylinders, 1-row radial, air c charged, 4-cycle. A.T.C. 153.	cooled, direct drive, not super-	
Construction	tion1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece countérbalanced crankshaft supported in 1 roller bearing and 1 plain bearing. Splined propeller shaft.		
Supercharger	SuperchargerNone.		
Carburation	Carburation 1 Holley 419 updraft carburetor.		
Ignition			
Lubrication Pressure feed, 80 lb./sq.in. (5,6 kg/cm ²). Dry sump.			
Starter	. Eclipse 390 hand starter.		
Compression ratio Diameter Length Frontal area Weight Weight/horsepowe Fuel consumption Oil consumption Gasoline grade Oil grade (viscosit Output/displacem Output/piston are Piston speed (max)	5.50 in540 cu.in5.5:145.6 in33.6 in11.3 sq.ft.	127 mm 140 mm 8.8 lit 5.5:1 1 158 mm 853 mm 1,05 m² 159 kg 0,91 kg/hp 250 g/hp/hr 11 g/hp/hr 73 octane 20,5 cs 18,2 hp/lit 0,26 hp/cm² 8,6 m/sec 8,9 kg/cm²	
Rating (normal)		level level	
R-52:	Similar to R-56. Tapered propell	er shaft. A.T.C. 153.	

R-55: Same as R-56, A.T.C. 153.



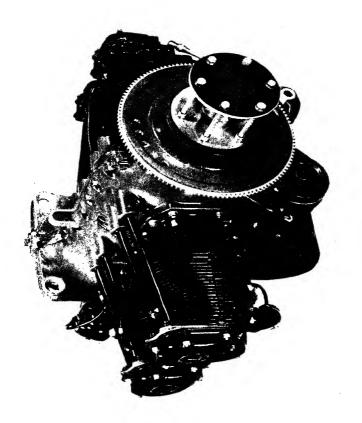
Lycoming O-145

Model	
Type 4 cylinders, horizontally oppose supercharged, 4-cycle. A.T.C. 23	ed, air cooled, geared drive, not
alloy cylinder heads. 1 inlet cylinder actuated by push ro	ivided vertically. 2 cylinders in- trankcase. Detachable aluminum valve and 1 exhaust valve per ds. 4-throw 1-piece counterbal- a 3 plain bearings. Spur reduc-
Supercharger None.	
Carburation 1 Bendix-Stromberg NA-S2 or carburetor.	Marvel-Schebler MA-2 updraft
Ignition	agnetos. 2 14-mm short reach
Lubrication Pressure feed, 65-85 lb./sq.in.	$(4.0 - 6.0 \text{ kg/cm}^2)$. Wet sump.
Starter Delco-Remy electric starter.	
Bore 3.625 in. Stroke 3.50 in. Displacement 144 cu.in. Compression ratio 6.5:1 Width 29.6 in. Height 23.0 in. Length 30.7 in. Frontal area 2.4 sq.ft. Weight 233 lb. Weight/horsepower 3.11 lb./h.p. Fuel consumption (cr.) 0.50 lb./h.p./hr. Oil consumption (cr.) 0.010 lb./h.p./hr. Gasoline grade 73 octane Oil grade (viscosity) 60-80 S.U. secs. Output/displacement 0.52 h.p./cu.in. Output/piston area 1.81 h.p./sq.in. Piston speed (max.) 1,867 ft./min. B.m.e.p. (max.) 129 lb./sq.in.	92 mm 89 mm 2,4 lit 6,5:1 752 mm 584 mm 780 mm 0,22 m² 106 kg 1,41 kg/hp 225 g/hp/hr 4,5 g/hp/hr 73 octane 10,3 - 15,6 cs 31,2 hp/lit 0,28 hp/cm² 9,5 m/sec 9,1 kg/cm²
Rating (take-off)	level level
O-145-A2, O-145-A3, O-145-A4: 55 h.p./2,300 r.p	

- A.T.C. 199.
- O-145-B2, O-145-B3, O-145-B4: 65 h.p./2,550 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 210.
- O-145-C2, O-145-C3, O-145-C4: 75 h.p./3,100 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 210.
- GO-145-C2, GO-145-C3: Same as GO-145-C4. Reduction gear ratio 0.63:1. A.T.C.

Note: O-145-A4, O-145-B4, O-145-C4 and GO-145-C4 engines are equipped with automotive type electric starters.





Lycoming O-235

Type 4 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. A.T.C. 223.

Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders

with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece counterbalanced crankshaft supported in 4 plain bearings. Equipped for tractor propeller.

ings. Equipped for tractor propeller.

Supercharger None.

Model O-235-C.

Carburation 1 Marvel-Schebler MA-3A updraft carburetor.

spark plugs per cylinder.

Lubrication Pressure feed, 65-85 lb./sq.in. (4,6-6,0 kg/cm²). Wet sump.

Starter Automotive type electric starter and starter ring.

111 mm 98 mm Displacement234 cu.in. 3.8 lit Compression ratio......6.25:1 6,25:1 821 mm Width32.3 in. 640 mm 764 mm Frontal area......3.2 sq.ft. 0,30 m² 111 kg 1,06 kg/hp Weight/horsepower2.34 lb./h.p. Fuel consumption (cr.) ... 0.47 lb./h.p./hr. 215 g/hp/hr Oil consumption (cr.) 0.015 lb./h.p./hr. 7 g/hp/hr Gasoline grade73 octane 73 octane Oil grade (viscosity) 80-100 S.U. secs. 15.6 - 20.5 cs 27.3 hp/lit Output/displacement0.44 h.p./cu.in. 0,27 hp/cm² Output/piston area.....1.73 h.p./sq.in. Piston speed (max.)1,679 ft./min. 8,5 m/sec 9,4 kg/cm² B.m.e.p. (max.)134 lb./sq.in.

Rating (take-off)104 h.p./2,600 r.p.m.

O-235-A: 100 h.p./2,600 r.p.m./take-off and normal rating at sea level.

Direct drive. Not supercharged. 73-octane gasoline. Automotive

type electric starter. A.T.C. 223.

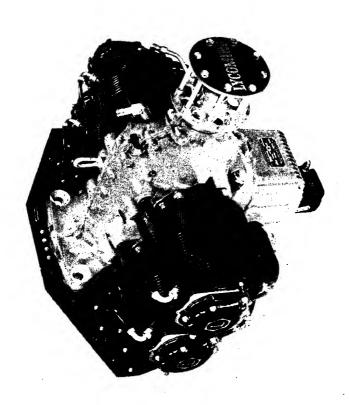
O-235-AP: Similar to O-235-A. Equipped for tractor or pusher propeller.

Automotive type electric starter. A.T.C. 223.

O-235-B: Same as O-235-A. Automotive type electric starter. A.T.C. 223.

O-235-BP: Same as O-235-A. Equipped for tractor or pusher propeller.

Eclipse E-80 electric starter, A.T.C. 223.

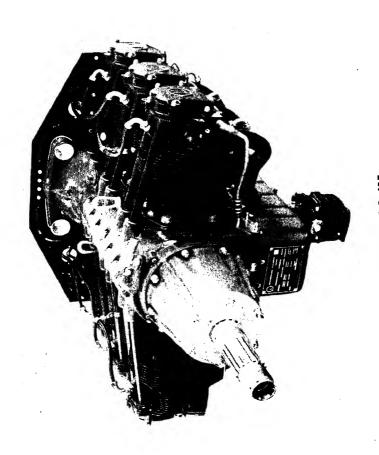


O-290-CP:

Lycoming O-290

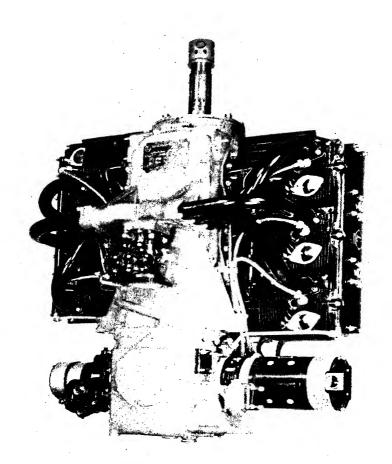
Model	O-290-C.	
Туре	.4 cylinders, horizontally oppose supercharged, 4-cycle. A.T.C. 22	d, air cooled, direct drive, not
Construction	.2-piece aluminum alloy crankca with steel barrels and aluminum 1 exhaust valve per cylinder a 1-piece counterbalanced cranksl ings. Equipped for tractor prope	n alloy heads. 1 inlet valve and ctuated by push rods. 4-throw naft supported in 4 plain bear-
Supercharger	. None.	
Carburation	.1 Marvel-Schebler MA-3SPA up	odraft carburetor.
Ignition	.2 Bendix-Scintilla SF4LN-8 m spark plugs per cylinder.	agnetos. 2 18-mm short reach
Lubrication	Pressure feed, 65-85 lb./sq.in. (4,6-6,0 kg/cm ²). Wet sump.
Starter	Eclipse E-80 direct cranking ele-	ctric starter.
Fuel consumption (of Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max.		124 mm 98 mm 4,7 lit 6,5:1 820 mm 676 mm 764 mm 0,34 m² 110 kg 0,84 kg/hp 225 g/hp/hr 7 g/hp/hr 73 octane 15,6 - 20,5 cs 27,7 hp/lit 0,27 hp/cm² 9,1 m/sec 8,9 kg/cm²
Rating (normal)		level evel
O-290-A:	Same as O-290-C. Automotive ty	ype electric starter. A.T.C. 229.
O-290-AP:	Similar to O-290-C. Equipped f Automotive type electric starter.	

Similar to O-290-C. Equipped for tractor or pusher propeller. Eclipse E-80 electric starter. A.T.C. 229.



Lycoming O-435

Model	.GO-435-B.	
Type	.6 cylinders, horizontally oppose supercharged, 4-cycle. A.T.C. pe	d, air cooled, geared drive, not
Construction	2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. I inlet valve and I exhaust valve per cylinder actuated by push rods. 6-throw I-piece counterbalanced crankshaft supported in 4 plain bearings. Planetary reduction gear, ratio 0.64:1.	
Supercharger	. None.	
Carburation	.1 Marvel-Schebler MA-4-5 updra	aft carburetor.
Ignition	2 Bendix-Scintilla SF6LN-8 m spark plugs per cylinder. Shield	agnetos. 2 18-mm short reach led ignition system.
Lubrication	Pressure feed, 65-85 lb./sq.in. ((4,6-6,0 kg/cm ²). Wet sump.
Starter	Eclipse E-80 direct cranking ele	ectric starter.
Fuel consumption (of Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max		124 mm 98 mm 7,5 lit 7,5:1 820 mm 752 mm 1 212 mm 0,36 m² 182 kg 0,83 kg/hp 210 g/hp/hr 9 g/hp/hr 9 g/hp/hr 91/96 grade 15,6 - 20,5 cs 29,3 hp/lit 30,3 hp/cm² 9,8 m/sec 9,5 kg/cm²
Rating (normal) .		level level
O-435A:	185 h.p./2,450 r.p.m./take-off a Direct drive. Not supercharged. electric starter. A.T.C. 228.	and normal rating at sea level. 73-octane gasoline. Delco-Remy
O-435-B:	235 h.p./3,000 r.p.m./take-off a Direct drive. Not supercharged.	100-octane gasoline. A.T.C. 228.
O-435-C:	185 h.p./2,450 r.p.m./take-off a Direct drive. Not supercharged.	nd normal rating at sea level. 73-octane gasoline, A.T.C. 228.
GO-435:	210 h.p./3,000 r.p.m./take-off a Reduction gear ratio 0.64:1. No line. A.T.C. 228.	

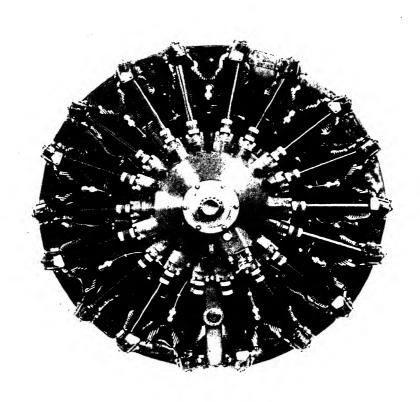


Lycoming O-435-D (Helicopter)

Lycoming O-435-D (Helicopter)

Model O-435-D.		
Type	ed, air cooled, direct drive, not ending.	
with steel barrels and aluminur 1 exhaust valve per cylinder actu tappets. 6-throw 1-piece cranksl ings and 1 main thrust roller	onstruction2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods and hydraulic tappets. 6-throw 1-piece crankshaft supported in 4 plain bearings and 1 main thrust roller hearing. Cooling fan on top of engine driven at crankshaft speed.	
SuperchargerNone.		
Carburation 1 Marvel-Schebler MA-4-5 updr	aft carburetor.	
Ignition2 Bendix-Scintilla SF6LN-8 m spark plugs per cylinder. Shiel		
Lubrication Pressure feed, 75 lb./sq.in. (5,	3 kg/cm ²). Dry sump.	
Starter Eclipse 777 direct cranking elec	tric starter.	
Bore	124 mm 98 mm 7.5 lit 7.5:1 843 mm 760 mm 1 105 mm 196 kg 0,92 kg/hp 215 g/hp/hr 9 g/hp/hr 100/130 grade 15,6 - 20,5 cs 28,2 hp/lit 0,29 hp/cm² 9,8 m/sec 9,1 kg/cm²	
Rating (take-off) .212 h.p./3,000 r.p.m. Rating (normal) .212 h.p./3,000 r.p.m./sea Rating (cruising) .150 h.p./2,700 r.p.m./sea	level level	

Note: This engine is designed for vertical installation in helicopters.

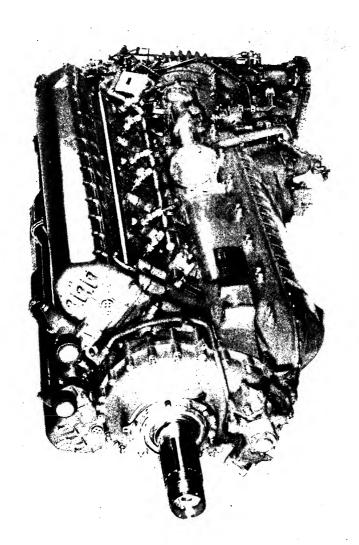


Lycoming R-680

Lycoming R-680

M. J.1	D 600 E2 A	
Model		
Type	4-cycle. A.T.C. 202.	ea, direct drive, ground boosted,
Construction	.1-piece barrel type aluminum a steel barrels and aluminum all exhaust valve (sodium cooled) rods. 1-throw 2-piece counterba 2 roller bearings.	loy heads. 1 inlet valve and 1 per cylinder actuated by push
Supercharger	. Gear-driven ground blower, ratio	1.0:1.
Carburation	.1 Bendix-Stromberg NA-R7A ca	irburetor.
Ignition 1 Bendix-Scintilla SC-A2 dual magneto. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication	Pressure feed, 50-75 lb./sq.in. ((3,5-5,3 kg/cm ²). Dry sump.
Starter	Eclipse 424 hand inertia starter.	
Fuel consumption of consumption (of Gasoline grade oil grade (viscosit Output/displaceme Output/piston area Piston speed (max. B.m.e.p. (max.)		117 mm 114 mm 11,1 lit 7,0:1 1 105 mm 953 mm 0,96 m² 234 kg 0,78 kg/hp 225 g/hp/hr 9 g/hp/hr 87 octane 20,5 - 25,1 cs 27,0 hp/lit 0,31 hp/cm² 8,7 m/sec 10,7 kg/cm²
Rating (normal) .	300 h.p./2,300 r.p.m285 h.p./2,200 r.p.m./sea214 h.p./1,910 r.p.m./sea	
R-680-B4D:	225 h.p./2,100 r.p.m./take-off at Direct drive. Ground blower, r A.T.C. 108.	

R-680-E3B: Same as R-680-E3A. A.T.C. 202.

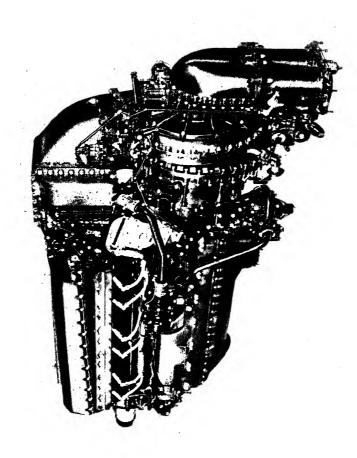


Packard V-1650-1

Model V-1650-1.	
Type	ressure water cooled, geared drive,
liners. 2 inlet valves and 2 exh cylinder actuated by overhead	case. 2 aluminum alloy cylinder for each block. Steel cylinder laust valves (sodium cooled) per camshaft. 6-throw 1-piece coun- rted in 7 plain bearings. Spur
Supercharger Gear-driven 2-speed 1-stage s 9.49:1. Automatic boost control	
Carburation 1 Bendix-Stromberg PD-16A1 carburetor with automatic mixt mixture control.	2-barrel injection type updraft ure control and 4-position manual
Ignition 2 B.T.H. C5SE12S-2 (American reach spark plugs per cylinder	
Lubrication Pressure feed, 70-80 lb./sq.in.	(4,9-5,6 kg/cm ²). Dry sump.
Starter Eclipse 792 or 840 direct crank	king electric starter.
Bore	137 mm 152 mm 27,0 lit 60:1 762 mm 1 082 mm 2 025 mm 0.54 m² 685 kg 0.53 kg/hp 205 g/hp/hr 8 g/hp/hr 100/130 grade 20,5 cs 48,1 hp/lit 0,73 hp/cm² 15,2 m/sec 14,7 kg/cm²
Rating (take-off) 1,300 h.p./3,000 r.p.m./ Rating (military, low) 1,240 h.p./3,000 r.p.m./ Rating (military, high) 1,120 h.p./3,000 r.p.m./ Rating (normal, low) 1,080 h.p./2,650 r.p.m./ Rating (normal, high) 1,010 h.p./2,650 r.p.m./	11,500 ft. (3 500 m) 18,500 ft. (5 600 m) 9,500 ft. (2 900 m)
This engine is similar to the British Rolls-Royce M Packard for use in United States aircraft.	Ierlin XX. It is manufactured by

The following 1-stage engines are manufactured by Packard for use in British aircraft:

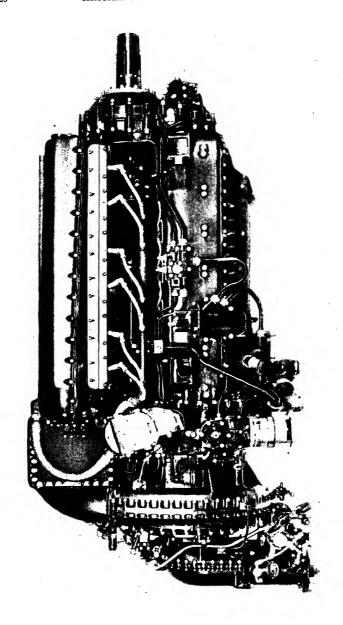
Merlin 28: Similar to V-1650-1. Reduction gear ratio 0.42:1. Merlin 29: Same as Merlin 28. Reduction gear ratio 0.48:1. Merlin 31, 33, 38: Same as Merlin 28. Reduction gear ratio 0.42:1.



Packard V-1650-3

Model	. V-1650-3.	
Type	. 12 cylinders, vee 60 degrees, pres supercharged, 4-cycle.	ssure water cooled, geared drive,
Construction	2-piece aluminum alloy cranko: blocks with detachable heads liners. 2 inlet valves and 2 exha- cylinder actuated by overhead eterbalanced crankshaft support reduction gear, ratio 0.479:1.	for each block. Steel cylinder aust valves (sodium cooled) per camshaft. 6-throw 1-piece coun-
Supercharger	Gear-driven 2-speed 2-stage su 8.095:1. Automatic boost contro sages and aftercooler.	
Carburation	.1 Bendix-Stromberg PD-18A1 carburetor with automatic mixtu mixture control.	
Ignition	.2 B.T.H. C6SE12S-2 (American- reach spark plugs per cylinder.	
Lubrication	Pressure feed, 70-80 lb./sq.in. (4,9-5,6 kg/cm ²). Dry sump.
Starter	Eclipse 840 direct cranking elec	ctric starter.
Fuel consumption (of consumption (of consumption (of Gasoline grade Oil grade (viscosity Output/displacement) Output/piston area Piston speed (max. B.m.e.p. (max.)		137 mm 152 mm 27,0 lit 6,0:1 762 mm 1 056 mm 2 212 mm 0,55 m ² 766 kg 0,51 kg/hp 205 g/hp/hr 8 g/hp/hr 100/130 grade 20,5 - 25,1 cs 55,1 hp/lit 0,84 hp/cm ² 15,2 m/sec 16,7 kg/cm ²
Rating (military, le Rating (military, h Rating (normal, le		3,750 ft. (4 200 m) 5,800 ft. (7 900 m) 7,400 ft. (5 300 m)

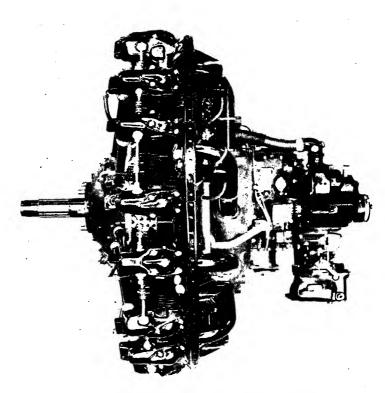
This engine is similar to the British Rolls-Royce Merlin 61. It is manufactured by Packard for use in United States aircraft.



Packard V-1650-7

Model	.V-1650-7.	
Type	.12 cylinders, vee 60 degrees, pre supercharged, 4-cycle.	ssure water cooled, geared drive,
Construction	2 inlet valves and 2 exhaust va der actuated by overhead can	ase. 2 aluminum alloy cylinder each block. Steel cylinder liners. lves (sodium cooled) per cylin- inshaft. 6-throw 1-piece counter- in 7 plain bearings. Spur reduc-
Supercharger	Gear-driven 2-speed 2-stage st 7.35:1. Automatic boost contro sages and aftercooler.	
Carburation	I Bendix-Stromberg PD-18A1 or updraft carburetor with automation manual mixture control.	PD-18C1 2-barrel injection type atic mixture control and 4-posi-
Ignition	.2 B.T.H. C6SE12S-2 (American-reach spark plugs per cylinder.	
Lubrication	Pressure feed, 70-80 lb./sq.in.	$(4.9 \cdot 5.6 \text{ kg/cm}^2)$. Dry sump.
Starter	Eclipse 840 direct cranking elec	tric starter.
Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption (of Gasoline grade Oil grade (viscosity Output/displacemen Output/piston area Piston speed (max.) B.m.e.p. (max.)		137 mm 152 mm 27,0 lit 6,0:1 762 mm 1 056 mm 2 212 mm 0,55 m ² 766 kg 0,48 kg/hp 225 g/hp/hr 2 g/hp/hr 100/130 grade 20,5 - 25,1 cs 58,9 hp/lit 0,92 hp/cm ² 15,2 m/sec 17,8 kg/cm ²
Rating (military, lo Rating (military, h Rating (normal, lo		500 ft. (2 600 m) 1,400 ft. (6 500 m) 1,300 ft. (3 400 m)

This engine is similar to the British Rolls-Royce Merlin 63. It is manufactured by Packard for use in United States aircraft.

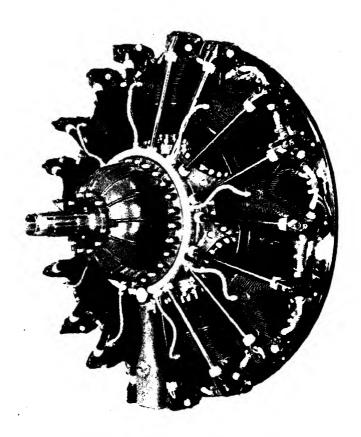


Pratt & Whitney Wasp Junior R-985

Pratt & Whitney Wasp Junior R-985

Model	R-985 SB3.	
Type	.9 cylinders, 1-row radial, air coo 4-cycle. A.T.C. 123.	led, direct drive, supercharged,
Construction	2-piece aluminum alloy crankcas and aluminum alloy heads. 1 inle cylinder actuated by push rods. 1 crankshaft supported in 2 roller matic propeller.	et valve and 1 exhaust valve per 1-throw 2-piece counterbalanced
Supercharger	Gear-driven 1-speed supercharger	r, ratio 10.0:1.
Carburation	1 Bendix-Stromberg NA-R9B or with automatic mixture control.	r NA-R9C updraft carburetor
Ignition	2 Bendix-Scintilla SB9RN-4 or A netos. 2 18 mm short reach spar ignition system.	american Bosch SB9RU-3 mag- k plugs per cylinder. Shielded
Lubrication	Pressure feed, 70-90 lb./sq.in. (4	4,9 - 6,3 kg/cm ²). Dry sump.
Starter	Optional. Eclipse E-160 direct coused.	ranking electric starter can be
Fuel consumption of consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max. B.m.e.p. (max.) Rating (take-off)	5.1875 in985 cu.in6.0:146.1 in43.1 in11.6 sq.ft.	132 mm 132 mm 16,1 lit 6,0:1 1 172 mm 1 094 mm 1,08 m² 309 kg 0,68 kg/hp 215 g/hp/hr 7 g/hp/hr 91/96 grade 20,5 - 25,1 cs 27,9 hp/lit 0,36 hp/cm² 10,1 m/sec 11,0 kg/cm² 5 in. (927 mm) Hg. boost 10 ft. (1 100 m)
Rating (normal) .		00 ft. (1 500 m)

Similar to R-985 SB3. 450 h.p./take-off and normal rating at sea R-985 T1B3: level. Direct drive. 1-speed supercharger, ratio 10.0:1. 91/96 grade gasoline. Provision for Hydromatic propeller. A.T.C. 123. Note: This engine can be modified for operation with its crank-shaft in a vertical plane for use in helicopters.



Pratt & Whitney Wasp R-1340

Pratt & Whitney Wasp R-1340

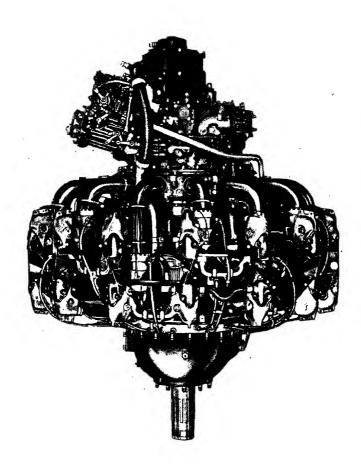
Model	R-1340 S3H1-G.	
Type	.9 cylinders, 1-row radial, air cool 4-cycle. A.T.C. 142.	led, geared drive, supercharged,
Construction	2-piece aluminum alloy crankcas and aluminum alloy heads. 1 is (sodium cooled) per cylinder a 2-piece counterbalanced cranksh ings. Planetary bevel reduction a Hydromatic propeller.	nlet valve and I exhaust valve actuated by push rods. 1-throw aft supported in 2 roller bear-
Supercharger	Gear-driven 1-speed supercharge	r, ratio 12.0:1.
Carburation	.1 Bendix-Stromberg NA-Y9E1 matic mixture control.	updraft carburetor with auto-
Ignition	.2 Bendix-Scintilla SB9RN-4 or a netos. 2 18-mm short reach spatignition system.	American Bosch SB9RU-3 mag- rk plugs per cylinder. Shielded
Lubrication	Pressure feed, 70-90 lb./sq.in. (4	1,9 - 6,3 kg/cm ²). Dry sump.
Starter	Optional, Eclipse E-160 direct cr direct cranking, electric starter	anking, or Series 43 inertia and can be used.
Compression ratio. Diameter	5.75 in1,344 cu.in6.0:151.8 in47.8 in14.6 sq.ft.	146 mm 146 mm 122,0 lit 6,0:1 1 315 mm 1 214 mm 1,36 m² 425 kg 0,71 kg/hp 220 g/hp/hr 7 g/hp/hr 91/96 grade 20,5 - 25,1 cs 27,2 hp/lit 0,40 hp/cm² 10,9 m/sec 11,0 kg/cm² 5 in. (927 mm) Hg. boost
Rating (normal) .		00 ft. (1 500 m)
R-1340 S1H1-G:	600 h.p./2,250 r.p.m./take-off; (1900 m) military rating; 550 h	n.p./2,200 r.p.m./8,000 ft. (2 400

R-1340 S1H1-G: 600 h.p./2,250 r.p.m./take-off; 600 h.p./2,250 r.p.m./6,200 ft. (1 900 m) military rating; 550 h.p./2,200 r.p.m./8,000 ft. (2 400 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger, ratio 12.0:1, 91/96 grade gasoline. Provision for Hydro-

matic propeller. A.T.C. 129.

R-1340 S3H1: 600 h.p./2,250 r.p.m./take-off: 600 h.p./2,250 r.p.m./3,000 ft. (900 m) military rating; 550 h.p./2,200 r.p.m./5,000 ft. (1500 m) normal rating. Direct drive. 1-speed supercharger, ratio 10.0:1. 91/96 grade gasoline. Provision for Hydromatic propeller. A.T.C. 143.

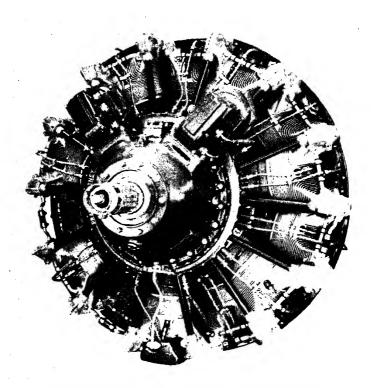




Pratt & Whitney Twin Wasp R-1830 (1-stage)

Model	
Type	, air cooled, geared drive, super-
exhaust valve (sodium coo rods. 2-throw 1-piece count	n alloy heads. I inlet valve and I led) per cylinder actuated by push erbalanced crankshaft supported in bevel reduction gear, ratio 0.56:1.
SuperchargerGear-driven 2-speed superch	narger, ratios 7.15:1 and 8.47:1.
Carburation 1 Bendix-Stromberg PD-121 carburetor with automatic	
Ignition	N-3 or American Bosch SF14LU-7 ch spark plugs per cylinder. Shielded
Lubrication Pressure feed, 75-100 lb./sq	in. (5,3 - 7,0 kg/cm ²). Dry sump.
Starter Optional. Eclipse 1416 direct cranking, electric st	
Bore	140 mm 140 mm 30,0 lit 6,7:1 1 224 mm 1 611 mm 1,17 m ² 678 kg 0,56 kg/hp 215 g/hp/hr 7 g/hp/hr 100/130 grade 20,5 - 25,1 cs 40,0 hp/lit 0,56 hp/cm ² 12,6 m/sec 13,5 kg/cm ²
Rating (take-off)	m./4,900 ft. (1 500 m) m./13,100 ft. (4 000 m) m./6,100 ft. (1 900 m) m./12,500 ft. (3 800 m) "/12,500 ft. (3 800 m)

Additional models of Pratt & Whitney Twin Wasp R-1830 (1-stage) engines will be found on page 143.



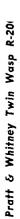
Pratt & Whitney Twin Wasp R-1830 (2-stage)

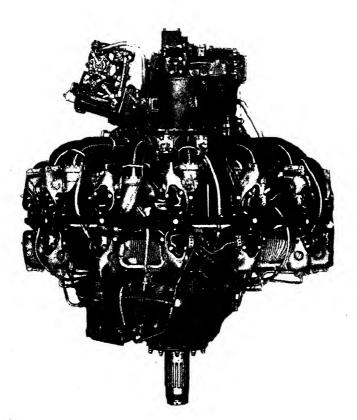
Pratt & Whitney Twin Wasp R-1830 (2-stage)

Model
Type
Construction3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary bevel reduction gear, ratio 0.316:1 or 0.67:1. Provision for Hydromatic propeller.
SuperchargerGear-driven 2-speed 2-stage supercharger consisting of a main stage (1-speed) ratio 8.08:1, and an auxiliary stage (2-speed) ratios 6.43:1 and 8.48:1. Intercooler. Automatic pressure regulator.
Carburation 1 Bendix-Stromberg PD-12E4 2-barrel injection type down-draft carburetor with automatic mixture control.
Ignition
LubricationPressure feed, 75-100 lb./sq.in. (5,3-7,0 kg/cm ²). Dry sump.
Starter Optional. Eclipse 1416 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.
Bore .5.50 in. 140 mm Stroke .5.50 in. 140 mm Displacement .1,830 cu.in. 30,0 lit Compression ratio .6.7:1 6,7:1 Diameter .48.2 in. 1 224 mm Length .67.5 in. 1 715 mm Frontal area .12.6 sq.ft. 1,17 m² Weight .1,572 lb. 684 kg Weight/horsepower .1.31 lb./h.p. 0,59 kg/hp Fuel consumption (cr.) 0.047 lb./h.p./hr. 215 g/hp/hr Oil consumption (cr.) 0.015 lb./h.p./hr. 7 g/hp/hr Gasoline grade .100/130 grade 100/130 grade Oil grade (viscosity) .100-120 S.U. secs. 20,5 - 25,1 cs Output/displacement 0.66 h.p./cu.in. 40,0 hp/lit Output/piston area .3.60 h.p./sq.in. 0,56 hp/cm² Piston speed (max.) .2,475 ft./min. 12,6 m/sec B.m.e.p. (max.) .192 lb./sq.in. 13,5 kg/cm²
Rating (take-off)1,200 h.p./2,700 r.p.m./48.0 in. (1 219 mm) Hg. boost Rating (military, main)1,200 h.p./2,700 r.p.m./2,500 ft. (800 m) Rating (military, low)1,150 h.p./2,700 r.p.m./9,500 ft. (2 900 m) Rating (military, high)1,100 h.p./2,700 r.p.m./17,500 ft. (5 300 m) Rating (normal, main)1,100 h.p./2,700 r.p.m./3,500 ft. (1 100 m) Rating (normal, low)1,050 h.p./2,550 r.p.m./3,500 ft. (1 100 m) Rating (normal, high)1,000 h.p./2,550 r.p.m./11,000 ft. (3 400 m) Rating (normal, high)1,000 h.p./2,550 r.p.m./19,000 ft. (5 800 m)

R-1930 SSC5-G: Same as R-1830 SSC7-G.

Note: The above engines were built for military purposes only and they were never actually given a commercial designation.

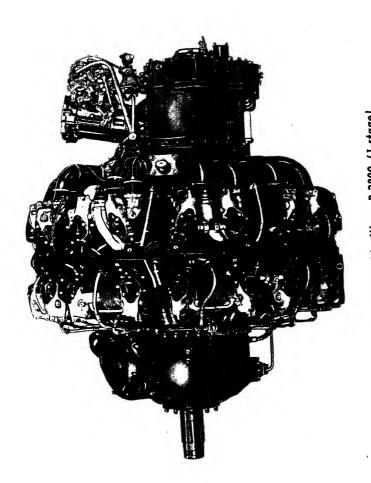




Pratt & Whitney Twin Wasp R-2000

Model	R-2000 2SD1-G (D series).		
Type	.14 cylinders, 2-row radial, air cooled, geared drive, supercharged, 4-cycle. A.T.C. pending.		
Construction	3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary bevel reduction gear, ratio 0.50:1. Provision for Hydromatic propeller.		
Supercharger	Gear-driven 2-speed supercharger, ratios 7.15:1 and 9.52:1.		
Carburation 1 Bendix-Stromberg PD-12F7 2-barrel injection type downdraft carburetor with automatic mixture control.			
Ignition			
Lubrication Pressure feed, 85-100 lb./sq.in. (6,0-7,0 kg/cm ²). Dry sump.			
Starter Optional. Eclipse 1416 direct cranking, or Series 48 inertia and direct cranking, electric starter can be used.			
Compression ratio Diameter Length Frontal area Weight Weight/horsepowe Fuel consumption Oil consumption Casoline grade Oil grade (viscosi Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		146 mm 140 mm 32,7 lit 6,5:1 1 257 mm 1 543 mm 1,24 m ² 721 kg 0,50 kg/hp 210 g/hp/hr 11 g/hp/hr 11 g/hp/hr 1100/130 grade 20,5 - 25,1 cs 44.3 hp/lit 0,62 hp/cm ² 12,6 m/sec 15,4 kg/cm ²	
Rating (military, l Rating (military, l Rating (normal, lo Rating (normal, h Rating (cruising)		,000 ft. (300 m) 6,000 ft. (4 900 m) ,500 ft. (2 200 m) 7,000 ft. (5 200 m) 700 ft. (4 500 m)	

An additional model of the Pratt & Whitney Twin Wasp R-2000 engine will be found on page 143.

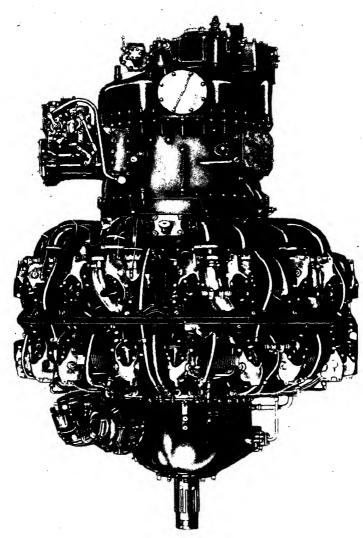


Pratt & Whitney Double Wasp R-2800 (1-stage)

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charged, 4-cycle. A.T.C. 231.
Construction . . . . 3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and cast aluminum alloy heads. 1 inlet valve and 1
                    exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in
                    3 plain bearings. Planetary spur reduction gear, ratio 0.50:1 or
                    0.56:1. Provision for Hydromatic propeller.
Supercharger ..... Gear-driven 2-speed 1-stage supercharger, ratios 7.60:1 and
                    9.89:1. Automatic boost control.
Carburation . . . . . . 1 Bendix-Stromberg PT-13G1 3-barrel injection type downdraft
                    carburetor with automatic mixture control.
Ignition . . . . . . . 1 Bendix-Scintilla DF18RN or American Bosch DF18RU-1 dual
                    magneto and 2 18-point distributors. 2 18-mm long reach spark
                    plugs per cylinder. Supercharged shielded ignition system.
Lubrication ...... Pressure feed, 75-100 lb./sq.in. (5,3-7,0 kg/cm<sup>2</sup>). Dry sump.
Starter ..... Optional. Eclipse 1416 direct cranking, or Series 48 inertia and
                    direct cranking, electric starter can be used.
146 mm
152 mm
                                                       45,9 lit
Displacement ...........2,804 cu.in.
Compression ratio......6.65:1
                                                       6.65:1
                                                       1 334 mm
1 923 mm
Frontal area................15.0 sq.ft.
                                                      1,40 \text{ m}^2
1 039 kg
Weight/horsepower .....1.14 lb./h.p.
                                                      0,52 kg/hp
Fuel consumption (cr.) ... 0.48 lb./h.p./hr.
                                                      215 g/hp/hr
Oil consumption (cr.) ... 0.015 lb./h.p./hr.
                                                      ll g/hp/hr
                                                      100/130 grade
20,5 - 25,1 cs
43,6 hp/lit
0,66 hp/cm<sup>2</sup>
Gasoline grade ...... 100/130 grade
Oil grade (viscosity) ..... 100-120 S.U. secs.
Output/displacement ....0.71 h.p./cu.in.
Output/piston area ......4.28 h.p./sq.in.
Piston speed (max.) ....2,700 ft./min.
B.m.e.p. (max.) ....208 lb./sq.in.
                                                       13,7 m/sec
                                                       14.6 kg/cm<sup>2</sup>
Rating (take-off) ......2,000 h.p./2,700 r.p.m./52.0 in. (1 321 mm) Hg. boost
Rating (military, low) ...2,000 h.p./2,700 r.p.m./1,500 ft. (450 m)
Rating (military, high) ...1,600 h.p./2,700 r.p.m./13,500 ft. (4 100 m)
Rating (normal, low) ....1,600 h.p./2,400 r.p.m./5,700 ft. (1 700 m)
Rating (cruising, low) ...1,450 h.p./2,400 r.p.m./13,000 ft. (4 000 m)
Rating (cruising, low) ...1,070 h.p./2,100 r.p.m./10,000 ft. (3 000 m)
Rating (cruising, high) ...975 h.p./2,100 r.p.m./17,500 ft. (5 300 m)
R-2800 TSB1-G (B series): 2,000 h.p./2,700 r.p.m./take-off; 2,000 h.p./2,700
```

r.p.m./1,500 ft. (450 m) military rating; 1,625 h.p./2,500 r.p.m./
6,500 ft. (2 000 m) normal rating. Reduction gear ratio 0.50:1
or 0.56:1. 1-speed 1-stage supercharger, ratio 7.60:1. 2 General
Electric S18LG-P1A magnetos. 100/130 grade gasoline. Provision for Hydromatic propeller. Note: This 1-speed engine
(illustrated on the opposite page) can be equipped with a turbo-supercharger.

Additional models of Pratt & Whitney Double Wasp R-2800 (1-stage) engines will be found on page 143.

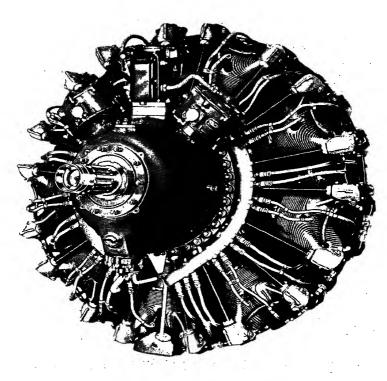


14

Pratt & Whitney Double Wasp R-2800 (2-stage)

Model	R-2800 SSB2-G (B series).	
Туре	.18 cylinders, 2-row radial, air charged, 4-cycle. A.T.C. pending	
Construction	3-piece forged aluminum alloy obarrels and cast aluminum allo exhaust valve (sodium cooled) rods. 2-throw 3-piece counterbal 3 plain bearings. Planetary spur 0.56:1. Provision for Hydromatic	by heads. 1 inlet valve and 1 per cylinder actuated by push lanced crankshaft supported in reduction gear, ratio 0.50:1 or
Supercharger	Gear-driven 2-speed 2-stage supstage (1-speed) ratio 7.80:1, an ratios 6.46:1 and 7.93:1. Interest lator.	d an auxiliary stage (2-speed)
Carburation	.1 Bendix-Stromberg PT-13D6 or downdraft carburetor with auto	
Ignition	.1 Bendix-Scintilla DF18RN or A magneto and 2 18-point distribu plugs per cylinder. Supercharge	tors. 2 18-mm long reach spark
Lubrication	Pressure feed, 75-100 lb./sq.in. ((5,3 - 7,0 kg/cm ²). Dry sump.
Starter	Optional. Eclipse 1416 direct cradirect cranking, electric starter	inking, or Series 48 inertia and can be used.
Fuel consumption (of Casoline grade Oil grade (viscosity Output/displacement Output/piston area Piston speed (max.	6.00 in2,804 cu.in6.65:152.5 in88.5 in15.0 sq.ft.	146 mm 152 mm 45,9 lit 6,65:1 1 334 mm 2 247 mm 1.40 m ² 1 125 kg 0,56 kg/hp 215 g/hp/hr 11 g/hp/hr 1100/130 grade 20,5 - 25,1 cs 43,6 hp/lit 0,66 hp/cm ² 13,7 m/sec 14,6 kg/cm ²
Rating (military, n Rating (military, la Rating (military, la Rating (normal, m Rating (normal, lo Rating (cruising, n Rating (cruising, la Rating (cruising) la		000 ft. (300 m) 5,500 ft. (4 700 m) 2,500 ft. (6 800 m) 500 ft. (1 700 m) 7,000 ft. (5 200 m) 1,500 ft. (6 600 m) 1,200 ft. (3 400 m) 0,000 ft. (6 100 m)

Note: C series engines similar to the B series engine above are now in production. They have forged aluminum alloy cylinder heads and improved supercharging. They are rated at 2,100 h.p. at take-off. (All other data restricted, January, 1945).



Pratt & Whitney Double Wasp R-2800 (2-stage)

Additional Models of Pratt & Whitney R-1830 (1-stage) Engines (Continued from page 133)

(Communed from page 155

R-1830 S1C3-G: 1,200 h.p./2,700 r.p.m./take-off; 1,200 h.p./2,700 r.p.m./4,900 ft. (1 500 m) military rating; 1,050 h.p./2,550 r.p.m./7,500 ft.

(2 300 m) normal rating. Reduction gear ratio 0.56:1. 1-speed supercharger, ratio 7.15:1. 91/96 grade gasoline. Provision for Hydromatic propeller. A.T.C. 186. Note: This 1-speed engine

can be equipped with a turbo-supercharger.

R-1830 S4C4-G: 1,200 h.p./2,700 r.p.m./take-off; 1,200 h.p./2,700 r.p.m./3,700 ft.

(1 100 m) and 900 h.p./2,700 r.p.m./17,400 ft. (5 300 m) military rating; 1,050 h.p./2,550 r.p.m./7,500 ft. (2 300 m) and 900 h.p./2,550 r.p.m./15,400 ft. (4 700 m) normal rating. Reduction gear ratio 0.67:1. 2-speed supercharger, ratios 7.15:1 and 8.47:1. 91/96 grade gasoline. Provision for Hydromatic pro

peller. A.T.C. 186.

Additional Model of Pratt & Whitney R-2000 Engines

(Continued from page 137)

R-2000 2SD-G: 1,350 h.p./2,700 r.p.m./take-off; 1,350 h.p./2,700 r.p.m./2,000 ft.

(600 m) military rating; 1,100 h.p./2,550 r.p.m./7,000 ft. (2 100 m) and 1,000 h.p./2,550 r.p.m./14,000 ft. (4 300 m) normal rating. Reduction gear ratio 0.50:1. 2-speed supercharger, ratios 7.15:1 and 3.47:1. 100/130 grade gasoline. Provision for Hy-

dromatic propeller. A.T.C. 230.

Additional Models of Pratt & Whitney R-2800 (1-stage) Engines

(Continued from page 139)

R-2800 S1A4-G: 1,850 h.p./2,600 r.p.m./take-off; 1,850 h.p./2,600 r.p.m./2,700 ft.

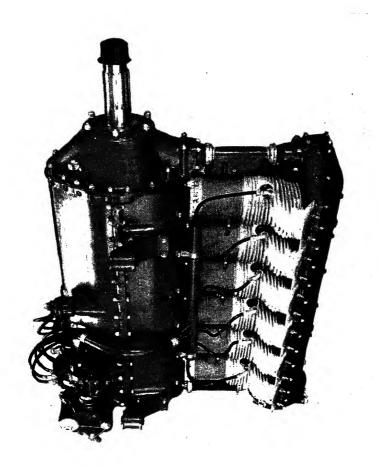
(800 m) and 1,500 h.p./2,600 r.p.m./14,000 ft. (4 300 m) military rating; 1,500 h.p./2,400 r.p.m./7,500 ft. (2 300 m) and 1,450 h.p./2,400 r.p.m./13,000 ft. (4 000 m) normal rating. Reduction gear ratio 0.40:1, 0.50:1 or 0.56:1. 2-speed supercharger, ratios 7.60:1 and 9.45:1. 100/130 grade gasoline. Provision for

Hydromatic propeller.

R-2800 \$1A6-G: 1,850 h.p./2,600 r.p.m./take-off; 1,850 h.p./2,600 r.p.m./2,700 ft. (800 m) military rating; 1,500 h.p./2,400 r.p.m./7,500 ft. (2 300

m) normal rating. Reduction gear ratio 0.40:1, 0.50:1 or 0.56:1. 1-speed supercharger, ratio 7.15:1. 100/130 grade gasoline. Pro-

vision for Hydromatic propeller.

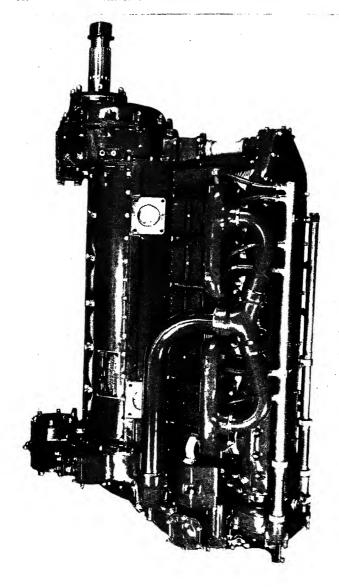


Ranger 6-440

Model	. 6-440C-5 (L-440-3).		
Type	.6 cylinders, inverted in-line, air cooled, direct drive, not super-charged, 4-cycle. A.T.C. 216.		
Construction	. 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. I inlet valve and I exhaust valve per cylinder actuated by overhead camshaft. 6-throw I-piece crankshaft equipped with vibration damper and supported in 7 plain bearings.		
Supercharger	.None.		
Carburation	1 Bendix-Stromberg NA-R4B or Marvel-Schebler MA-4-5 updraft carburetor.		
Ignition	on I Bendix-Scintilla SB6RN-8 magneto and 1 Bendix-Scintilla SB6RN-10 magneto. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication	Pressure feed, 50-70 lb./sq.in.	(3,5 - 4,9 kg/cm ²). Dry sump.	
Starter	Eclipse E-80 direct cranking electric starter.		
Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosi Output/displaceme Output/piston are Piston speed (max		105 mm 140 mm 7,2 lit 7,5:1 556 mm 850 mm 1 351 mm 0,28 m² 170 kg 0.85 kg/hp 195 g/hp/hr 9 g/hp/hr 87 octane 20,5 - 25,1 cs 27,8 hp/lit 0,39 hp/cm² 11,2 m/sec 10,3 kg/cm²	
Rating (take-off)			
6-440C-2 (L-440-1): 175 h.p./2,450 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 216.			
6-440C-3:	180 h.p./2,450 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 73-octane gasoline. A.T.C. 216.		

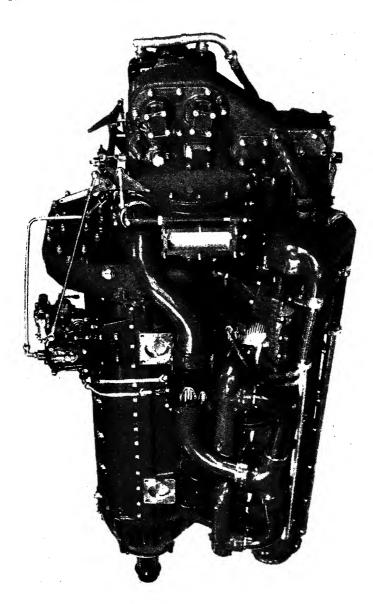
190 h.p./2,450 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged. 80-octane gasoline. A.T.C. 216.

6-440C-4:



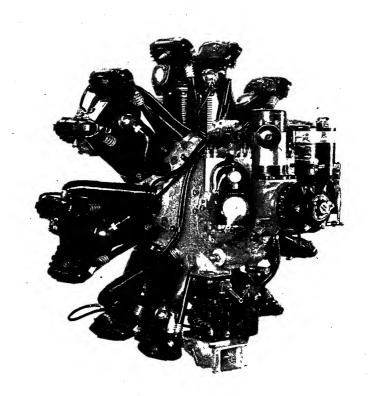
Ranger SGV-770C

Model SGV-770C-1B (C series).	
Type	grees, air cooled, geared drive, nding.
Construction 2-piece aluminum alloy crankca rels with integral aluminum al heads. 1 inlet valve and 1 exha cylinder actuated by overhead c shaft with pendulum type vibr plain bearings. Herringbone red sion for Hydromatic or constant	loy fins) and aluminum alloy ust valve (sodium cooled) per amshaft. 6-throw 1-piece crank- ation dampers supported in 7 uction gear, ratio 0.67:1. Provi-
SuperchargerGear-driven 1-speed supercharge	r, ratio 9.5:1.
Carburation 1 Bendix-Stromberg QD-9B1 spi	inner injection type carburetor.
Ignition 1 Bendix-Scintilla DFLN-6 dua tributors, 2 14-mm short reach sp ignition system.	
Lubrication Pressure feed, 60-80 lb./sq.in. (4,2-5,6 kg/cm ²). Dry sump.
Starter Optional. Eclipse E-160 or 1416 inertia and direct cranking, elec	direct cranking, or Series 43 tric starter can be used.
Bore	102 mm 130 mm 12,7 lit 6,5:1 825 mm 869 mm 1 702 mm 0,52 m² 345 kg 0,66 kg/hp 220 g/hp/hr 9 g/hp/hr 9 l/96 grade 20,5 - 25,1 cs 40,9 hp/lit 0,53 hp/cm² 13,2 m/sec 11,8 kg/cm²
Rating (take-off) 520 h.p./3.150 r.p.m./42. Rating (military) 520 h.p./3.150 r.p.m./12. Rating (normal) 450 h.p./3,000 r.p.m./12. Rating (max. cruising) 340 h.p./2,725 r.p.m./15.	000 ft. (3 700 m) 000 ft. (3 700 m)



Ranger SGV-770D

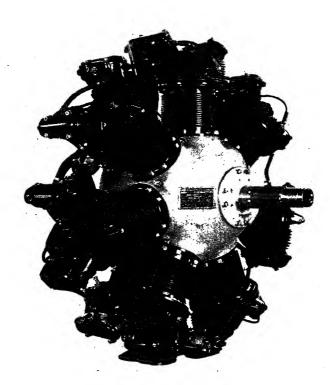
Model SGV-770D-5 (D series).	
Type	egrees, air cooled, geared drive, pending.
Construction 2-piece aluminum alloy crankca rels with integral aluminum al heads. 1 inlet valve and 1 exha cylinder actuated by overhead c shaft with pendulum type vibr plain bearings. Planetary reduct	lloy fins) and aluminum alloy tust valve (sodium cooled) per tamshaft. 6-throw 1-piece crank- tation dampers supported in 7
SuperchargerGear-driven 1-speed supercharge	er, ratio 8.85:1.
Carburation 1 Bendix-Stromberg QM-8A2 i direct injection onto supercharg regulator.	
Ignition	
Lubrication Pressure feed, 65-75 lb./sq.in. ((4,6-5,3 kg/cm ²). Dry sump.
Starter Optional. Eclipse E-160 or 1416 inertia and direct cranking, elec	
Bore	102 mm 130 mm 12,7 lit 6,5:1 846 mm 789 mm 1 903 mm 0,46 m ² 394 kg 0,56 kg/hp 225 g/hp/hr 11 g/hp/hr 11 g/hp/hr 100/130 grade 20,5 - 25,1 cs 55,1 hp/lit 0,72 hp/cm ² 15,6 m/sec 14,0 kg/cm ²
Rating (take-off)	00 ft. (2 400 m) 000 ft. (4 000 m)



Warner Scarab

Warner Scarab

Model	Scarab 50.	
Type	.7 cylinders, 1-row radial, air c charged, 4-cycle. A.T.C. 2.	ooled, direct drive, not super-
Construction	2-piece aluminum alloy crankcas and aluminum alloy heads. 1 inle cylinder actuated by push rods. 1 crankshaft supported in 2 ball be	t valve and 1 exhaust valve per l-throw 1-piece counterbalanced
Supercharger	None.	
Carburation	1 Holley 419 updraft carburetor.	
Ignition	2 Bendix-Scintilla VMN-7D ma spark plugs per cylinder.	agnetos. 2 18-mm short reach
Lubrication	Pressure feed, 50-90 lb./sq.in. (3	3,5 - 6,3 kg/cm ²). Dry sump.
Starter	Eclipse E-80 direct cranking elec	tric starter.
Fuel consumption (of Casoline grade Oil grade (viscosity Output/displacemen Output/piston area Piston speed (max.		108 mm 108 mm 108 mm 6,9 lit 5,2:1 929 mm 737 mm 0,68 m² 129 kg 0,98 kg/hp 240 g/hp/hr 11 g/hp/hr 73 octane 15,6 - 20,5 cs 19,0 hp/lit 0,20 hp/cm² 7,8 m/sec 8,0 kg/cm²
Rating (normal) .	131 h.p./2,160 r.p.m 125 h.p./2,050 r.p.m./sea 90 h.p./1,900 r.p.m./sea l	level evel
Scarab 50-B:	Same as Scarab 50. No starter.	A.T.C. 2.



Warner Super Scarab 165

Warner Super Scarab 165

Model Super Scarab 165.

Construction2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 ball bearings. Equipped for fixed pitch propeller.

Supercharger None.

Carburation 1 Holley 419 updraft carburetor.

Ignition....... 2 Bendix-Scintilla VMN-7DF magnetos. 2 18-mm short reach spark plugs per cylinder.

Lubrication Pressure feed, 50-90 lb./sq.in. (3,5-6,3 kg/cm²). Dry sump.

Starter Eclipse E-80 direct cranking electric starter.

117 mm 108 mm 8,2 lit Displacement499 cu.in. 6,4:1 Compression ratio.......6.4:1 945 mm 775 mm Frontal area7.5 sq.ft. 0.70 m^2 155 kg Weight341 lb. Weight/horsepower1.95 lb./h.p. 0,88 kg/hp 260 g/hp/hr Fuel consumption (cr.) ... 0.54 lb./h.p./hr. Oil consumption (cr.) 0.020 lb./h.p./hr. 9 g/hp/hr Gasoline grade73 octane 73 octane 15,6 - 20,5 cs Oil grade (viscosity)80-100 S.U. secs. 21,3 hp/lit 0,23 hp/cm² Output/displacement0.35 h.p./cu.in. Output/piston area1.48 h.p./sq.in. Piston speed (max.)1,594 ft./min. 8,1 m/sec B.m.e.p. (max.)123 lb./sq.in. 8.6 kg/cm²

Rating (take-off)175 h.p./2,250 r.p.m.
Rating (normal)165 h.p./2,100 r.p.m./sea level
Rating (cruising)127 h.p./1,900 r.p.m./sea level

Super Scarab 165-A: Same as Super Scarab 165. A.T.C. 214.

Super Scarab 165-B: Same as Super Scarab 165. Equipped for 2-position controllable pitch propeller, A.T.C. 214.

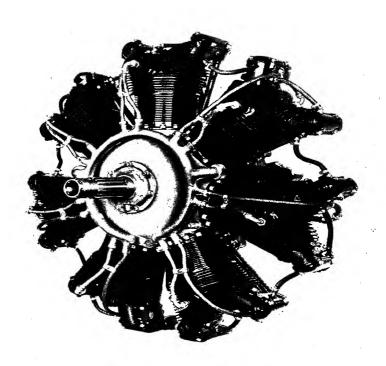
Super Scarab 165-D: Same as Super Scarab 165. Equipped for constant speed propeller. A.T.C. 214.

Super Scarab 165-E: Same as Super Scarab 165. Hand starter. A.T.C. 214.

Super Scarab 165-G: Similar to Super Scarab 165. Short front crankcase and short crankshaft, A.T.C. 214.

Super Scarab 165-AE: Same as Super Scarab 165-A. Hand starter. A.T.C. 214.

Super Scarab 165-BE, 165-DE: Same as Super Scarab 165-B. Hand starter. A.T.C. 214.



Warner Super Scarab 185

Warner Super Scarab 185

Model Super Scarab 185.

Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 ball bearings. Equipped for fixed

pitch propeller.

Supercharger None.

Carburation 1 Holley 419 updraft carburetor.

Lubrication Pressure feed, 70 lb./sq.in. (4,9 kg/cm²). Dry sump.

Starter Optional. Eclipse E-80 direct cranking electric starter can be used.

124 mm 108 mm Displacement555 cu.in. 9,1 lit Compression ratio6.2:1 6.2:1 945 mm 775 mm Frontal area7.5 sq.ft. 0.70 m^2 159 kg Weight350 lb. Weight/horsepower1.75 lb./h.p. 0,79 kg/hp 245 g/hp/hr Fuel consumption (cr.) ... 0.54 lb./h.p./hr. 9 g/hp/hr Oil consumption (cr.) ... 0.020 lb./h.p./hr. Gasoline grade73 octane 73 octane 15,6 - 25,1 cs Oil grade (viscosity) 80-120 S.U. secs. 22,0 hp/lit Output/displacement0.36 h.p./cu.in. 0,24 hp/cm² Output/piston area1.53 h.p./sq.in. Piston speed (max.)1,753 ft./min. 8.9 m/sec 8,1 kg/cm² B.m.e.p. (max.)115 lb./sq.in.

Rating (take-off)200 h.p./2,475 r.p.m.

Super Scarab 185-A: Same as Super Scarab 185.

Super Scarab 185-B: Same as Super Scarab 185. Equipped for 2-position controllable pitch propeller.

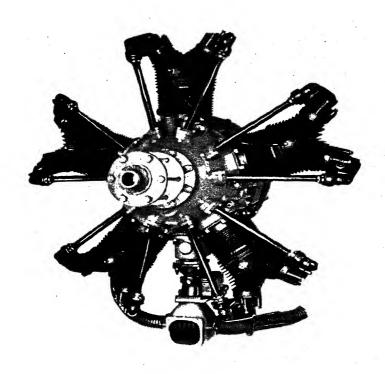
Super Scarab 185-D: Same as Super Scarab 185. Equipped for constant speed propeller.

Super Scarab 185-E: Same as Super Scarab 185. Hand starter.

Super Scarab 185-G: Similar to Super Scarab 185. Short front crankcase and short crankshaft.

Super Scarab 185-AE: Same as Super Scarab 185-A. Hand starter.

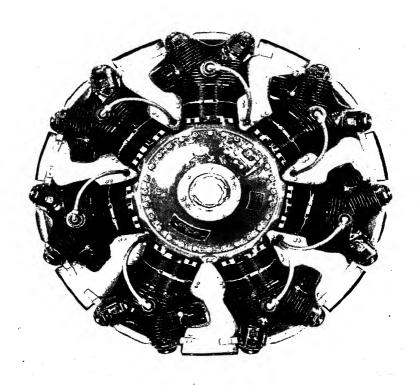
Super Scarab 185-BE, 185-DE: Same as Super Scarab 185-B. Hand starter.



White R-275S

White R-275S

Model			
Type			
Construction 3-piece magnesium alloy crankcase divided vertically. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 3 ball-bearings and 1 plain bearing.			
SuperchargerNone.			
Carburation 1 Bendix-Stromberg NA-S pres	sure type updraft carburetor.		
Ignition2 Edison-Splitdorf RM-5 magne plugs per cylinder. Shielded ig			
Lubrication Pressure feed, 60 lb./sq.in. (4,2 kg/cm²). Dry sump. Starter Optional. Eclipse E-80 direct cranking electric starter or Eclipse 390 hand starter can be used.			
Bore 4.125 in. Stroke 4.00 in. Displacement 266 cu.in. Compression ratio 6.2:1 Diameter 34.2 in. Length 23.9 in. Frontal area 6.4 sq.ft. Weight 192 lb. Weight/horsepower 1.67 lb./h.p./hr. Oil consumption (cr.) 0.51 lb./h.p./hr. Oil consumption (cr.) 0.014 lb./h.p./hr. Gasoline grade 80 octane Oil grade (viscosity) 100-120 S.U. secs. Output/displacement 0.43 h.p./cu.in. Output/piston area 1.72 h.p./sq.in. Piston speed (max.) 1,533 ft./min. B.m.e.p. (max.) 148 lb./sq.in.	105 mm 102 mm 4,3 lit 6,2:1 869 mm 607 mm 0,60 m ² 87 kg 0,76 kg/hp 230 g/hp/hr 6 g/hp/hr 80 octane 20,5 - 25,1 cs 26,7 hp/lit 0,27 hp/cm ² 7,8 m/sec 10,4 kg/cm ²		
Rating (take-off)			

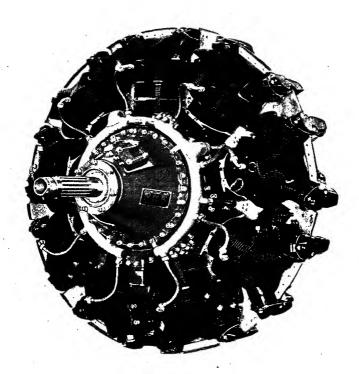


Wright Whirlwind R-760

Wright Whirlwind R-760

Model	. R-760 E2.	
Туре	.7 cylinders, 1-row radial, air boosted, 4-cycle. A.T.C. 155.	cooled, direct drive, ground
Construction	.1-piece barrel type aluminum a steel barrels and aluminum all exhaust valve per cylinder act 2-piece counterbalanced cranksh ings.	oy heads. 1 inlet valve and 1 tuated by push rods. 1-throw
Supercharger	. Gear-driven ground blower, ratio	9.17:1.
Carburation	.1 Bendix-Stromberg NA-R7A up	draft carburetor.
Ignition	. 2 Bendix-Scintilla VMN-7DE magnetos. 2 18-mm long reach sp ignition system.	
Lubrication	Pressure feed, 60-80 lb./sq.in. (4,2-5,6 kg/cm ²). Dry sump.
Starter	. Eclipse E-160 direct cranking ele	ectric starter.
Weight Weight/horsepower Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosi Output/displacem Output/piston are Piston speed (ma B.m.e.p. (max.)	5.50 in. 756 cu.in. 6.3:1 45.0 in. 42.4 in. 11.0 sq.ft. 570 lb. 1.63 lb./h.p./hr. (cr.) 0.48 lb./h.p./hr. (cr.) 0.018 lb./h.p./hr. 91/96 grade ty) 100-120 S.U. secs. ent 0.46 h.p./cu.in. a 2.54 h.p./sq.in. x.) 2,200 ft./min, 153 lb./sq.in.	127 mm 140 mm 12,4 lit 6,3:1 1 143 mm 1 078 mm 1,02 m ² 258 kg 0,70 kg/hp 215 g/hp/hr 8 g/hp/hr 91/96 grade 20,5 - 25,1 cs 28,1 hp/lit 0,39 hp/cm ² 11,2 m/sec 10,8 kg/cm ²
Rating (normal)		level level

R-760 E1: 300 h.p./2,250 r.p.m./take-off; 285 h.p./2,100 r.p.m./sea level normal rating. Direct drive. Ground blower, ratio 7.05:1. 73-octane gasoline. A.T.C. 94.



Wright Whirlwind R-975

Wright Whirlwind R-975

Type	9 cylii	ders, 1-		air	cooled,	direct	drive,	super	charged,
0	•		,.					~ 1. 1	

Construction1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings.

Supercharger.....Gear-driven 1-speed supercharger, ratio 10.15:1.

R-975 E3.

Carburation 1 Bendix-Stromberg NA-R9A updraft carburetor.

Ignition........... Bendix-Scintilla VAG-9DFR magnetos, 2 18-mm long reach

spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60-80 lb./sq.in. (4,2-5,6 kg/cm²). Dry sump.

Starter Eclipse E-160 direct cranking electric starter.

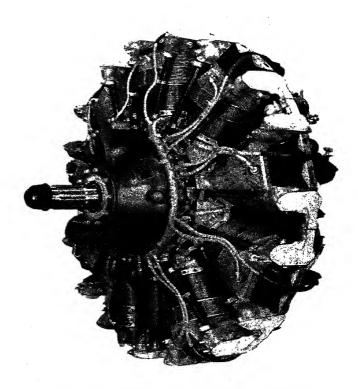
Bore5.00 in.	127 mm
Stroke5.50 in.	140 mm
Displacement973 cu.in.	15,9 lit
Compression ratio6.3:1	6,3:1
Diameter	1 143 mm
Length	1 046 mm
Frontal area11.0 sq.ft.	$1,02 \text{ m}^2$
Weight	306 kg
Weight/horsepower1.50 lb./h.p.	0.68 kg/hp
Fuel consumption (cr.) 0.46 lb./h.p./hr.	210 g/hp/hr
Oil consumption (cr.) 0.020 lb./h.p./hr.	9 g/hp/hr
Gasoline grade91/96 grade	91/96 grade
Oil grade (viscosity)100-120 S.U. secs.	20,5 - 25,1 cs
Output/displacement0.47 h.p./cu.in.	28,2 hp/lit
Output/piston area2.54 h.p./sq.in.	0.39 hp/cm^2
Piston speed (max.)2,062 ft./min.	10.5 m/sec
B.m.e.p. (max.)163 lb./sq.in.	$11,5 \text{ kg/cm}^2$

Rating (take-off)450 h.p./2,250 r.p.m./36.5 in. (927 mm) Hg. boost

R-975 E1:

Model

365 h.p./2,100 r.p.m./take-off and normal rating at sea level. Direct drive. Ground blower, ratio 7.8:1. 73-octane gasoline. A.T.C. 87.



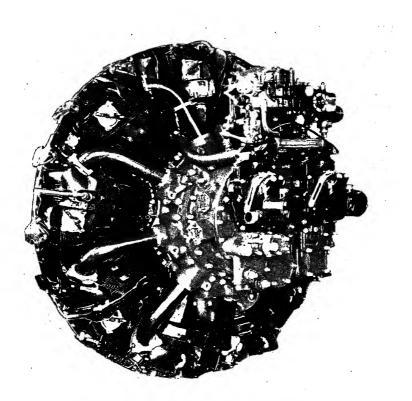
Wright Cyclone 9 R-1820 (H series)

Wright Cyclone 7 R-1300

$Model\dots\dots\dots$	735C7BA1.	
Туре	.7 cylinders, 1-row radial, air cool 4-cycle. A.T.C. pending.	ed, geared drive, supercharged,
Construction	.2-piece steel crankcase. Cylinde type aluminum alloy fins, and 1 inlet valve and 1 exhaust valve actuated by push rods. 1-throw shaft supported in 2 roller bear ratio 0.67:1.	forged aluminum alloy heads. e (sodium cooled) per cylinder 2-piece counterbalanced crank-
Supercharger	.Gear-driven 2-speed supercharge	r, ratios 7.21:1 and 8.69:1.
Carburation	.1 Bendix-Stromberg PD-9E1 2-b carburetor.	parrel pressure type downdraft
Ignition	.2 American Bosch SF7LU magne plugs per cylinder. Shielded ign	
Lubrication	Pressure feed, 70 lb./sq.in. (4,9	kg/cm ²). Dry sump.
Starter	Optional. Eclipse E-160 direct and direct cranking, electric sta	
Compression ratio Diameter Length Frontal area Weight Weight/horsepowe Fuel consumption Oil consumption Casoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		155 mm 160 mm 21,3 lit 6,2:1 1 323 mm 1 224 mm 1,38 m ² 431 kg 0,62 kg/hp 210 g/hp/hr 7 g/hp/hr 91/96 grade 25,1 cs 32,9 hp/lit 0,52 hp/cm ² 13,7 m/sec 11,5 kg/cm ²
Rating (normal, lo Rating (normal, his Rating (cruising, la Rating (cruising, la		level to 9,500 ft. (2 900 m) 700 - 17,000 ft. (4 500 - 5 200 m) level to 16,200 ft. (4 900 m) 500 - 22,400 ft. (6 200 - 6 800 m)
Optional equipmen	it: Cooling fan driven at propelle	r speed, weight 50 lb. (22 kg).

Optional equipment: Cooling fan driven at propeller speed, weight 50 lb. (22 kg). Gear-driven 1-speed supercharger instead of 2-speed supercharger.

Note. No photograph of the Wright Cyclone 7 is available as of January, 1945. It is similar in construction to the Wright Cyclone 9 shown on the opposite page.

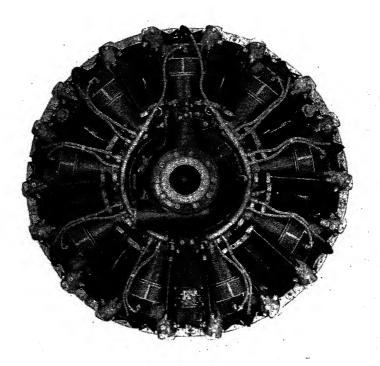


Wright Cyclone 9 R-1820 (G-series)

Wright Cyclone 9 R-1820 (G series)

Model	704C9GC (G205A).		
Type	.9 cylinders, 1-row radial, air coo 4-cycle. A.T.C. 219.	oled, geared drive, supercharged,	
Construction	cooled) per cylinder actuated	alve and 1 exhaust valve (sodium by push rods. 1-throw 2-piece apported in 2 roller bearings.	
Supercharger	.Gear-driven 2-speed supercharge	er, ratios 7.14:1 and 10.0:1.	
Carburation	.1 Bendix-Stromberg PD-12H3 2 carburetor with automatic mixtu mixed control. Optional: 1 downdraft carburetor.	-barrel injection type downdraft tre control and 4-position manual Holley 1375F variable venturi	
Ignition	.2 Bendix-Scintilla SF9LN-3 or netos. 2 18-mm long reach spa ignition system.	American Bosch SF9LU-3 mag- rk plugs per cylinder. Shielded	
Lubrication	Pressure feed, 60-75 lb./sq.in.	(4,6-5,3 kg/cm ²). Dry sump.	
Starter Optional. Eclipse E-160 direct cranking, or Series 43 inertia and direct cranking, electric starter can be used.			
Compression ratio. Diameter Length Frontal area Weight Weight/horsepower Fuel consumption (of Gasoline grade Oil grade (viscosity Output/displacemen Output/piston area Piston speed (max. B.m.e.p. (max.)		155 mm 175 mm 29,9 lit 6,7:1 1 400 mm 1 270 mm 1.53 m² 599 kg 0,50 kg/hp 210 g/hp/hr 9 g/hp/hr 9 g/hp/hr 9 g/hp/hr 9 g/hp/lr 10,70 hp/cm² 14,6 m/sec 14,7 kg/cm²	
Rating (normal, low Rating (normal, high	1,200 h.p./2,500 r.p.m./4; w)1,000 h.p./2,300 r.p.m./6, gh)900 h.p./2,300 r.p.m./15,20 sing)700 h.p./2,000 r.p.m./no	900 ft. (2 100 m) 00 ft. (4 600 m)	

Additional models of Wright Cyclone 9 (C series) engines will be found on page 173.

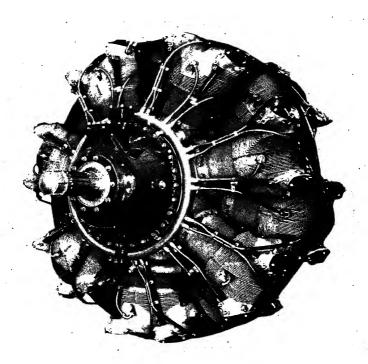


Wright Cyclone 9 R-1820 (H series)

Wright Cyclone 9 R-1820 (H series)

Model	.806 C9HC1.	
Type	.9 cylinder, 1-row radial, air cool 4-cycle.	led, geared drive, supercharged,
Construction	.2-piece steel crankcase. Cylinder aluminum alloy fins, and forged valve and 1 exhaust valve (sodiu: by push rods. 1-throw 2-piece c ported in 2 roller bearings. Plane or 0.67:1.	d aluminum alloy heads, 1 inlet m cooled) per cylinder actuated counterbalanced crankshaft sup-
Supercharger	.Gear-driven 2-speed supercharge	er, ratios 7.13:1 and 10.04:1.
Carburation	.1 Bendix-Stromberg PD-12K10 draft carburetor with automatic manual mixture control.	
Ignition	.2 Edison-Splitdorf SF9LD-1 or netos. 2 18-mm long reach sparignition system.	
Lubrication	.Pressure feed, 65-75 lb./sq.in. (4,6-5,3 kg/cm ²). Dry sump.
Starter	Optional. Eclipse E-160 or 1416 inertia and direct cranking, elec	
Compression ratio Diameter Length Frontal area Weight Weight/horsepowe Fuel consumption Oil consumption Casoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)	6.875 in. 1,823 cu.in. 6.55:1 55.1 in. 47.5 in. 16.6 sq.ft. 1,333 lb. r 0.99 lb./h.p. (cr.) 0.46 lb./h.p./hr. cr.) 0.020 lb./h.p./hr. 100/130 grade ty) 120 S.U. secs. ent 0.74 h.p./cu.in. 3.509 h.p./sq.in. 3,094 ft./min. 217 lb./sq.in.	155 mm 175 mm 29,9 lit 6,55:1 1 400 mm 1 207 mm 1,53 m ² 605 kg 0,45 kg/hp 210 g/hp/hr 9 g/hp/hr 100/130 grade 25,1 cs 45,1 hp/lit 0,79 hp/cm ² 15,7 m/sec 15,2 kg/cm ²
Rating (military, l Rating (military, l Rating (normal, lo Rating (normal, h	1,350 h.p./2,700 r.p.m./48(high) 1,300 h.p./2,600 r.p.m./4,(high) 1,000 h.p./2,600 r.p.m./17(bw) 1,200 h.p./2,500 r.p.m./5, igh) 900 h.p./2,500 r.p.m./18,50 r.p.	000 ft. (1 200 m) 7,500 ft. (5 300 m) ,500 ft. (1 700 m) 500 ft. (5 600 m)
805C9HC1 (H se	eries): 1 350 hn/2 700 rnm/ta	ke-off: 1.300 h.p./2.600 r.p.m./

805C9HC1 (H series): 1,350 h.p./2,700 r.p.m./take-off; 1,300 h.p./2,600 r.p.m./
4,000 ft. (1 200 m) military rating; 1,200 h.p./2,500 r.p.m./5,000
ft. (1 500 m) normal rating. Reduction gear ratio 0.56:1 or
0.67:1. 1-speed supercharger, ratio 7.0:1. 100/130 grade gasoline. Note: This 1-speed engine can be equipped with a turbosupercharger.

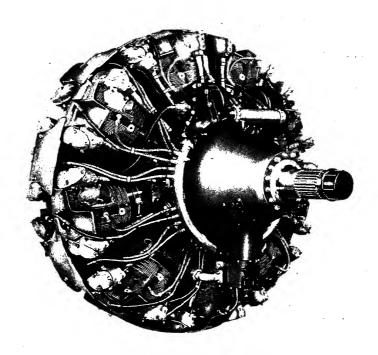


Wright Cyclone 14 R-2600

Wright Cyclone 14 R-2600

Model	
Type	r cooled, geared drive, super-
valve and 1 exhaust valve (see ated by push rods. 2-throw 3-p	rs with steel barrels with W-type aluminum alloy heads. 1 inlet dium cooled) per cylinder actu- iece counterbalanced crankshaft Planetary reduction gear, ratio
Supercharger Gear-driven 2-speed supercharge	er, ratios 7.06:1 and 10.06:1.
Carburation 1 Bendix-Stromberg PR-48A1 retor with automatic mixture	
Ignition 2 American Bosch SF14LU-10 spark plugs per cylinder. Shiel	
Lübrication Pressure feed, 75-90 lb./sq.in.	(5,3-6,3 kg/cm ²). Dry sump.
Starter Optional. Eclipse E-160 or 141 inertia and direct cranking, elec	
Bore 6.125 in. Stroke 6.3125 in. Displacement 2,603 cu.in. Compression ratio 6.9:1 Diameter 54.1 in. Length 66.1 in. Frontal area 16.0 sq.ft. Weight 2,045 lb. Weight/horsepower 1.07 lb./h.p. Fuel consumption (cr.) 0.46 lb./h.p./hr. Oil consumption (cr.) 0.020 lb./h.p./hr. Casoline grade 100/130 grade Oil grade (viscosity) 120 S.U. secs. Output/displacement 0.73 h.p./cu.in. Output/piston area 4.61 h.p./sq.in. Piston speed (max.) 2,946 ft./min. B.m.e.p. (max.) 206 lb./sq.in.	155 mm 160 mm 42,7 lit 6,9:1 1 374 mm 1 678 mm 1,48 m ² 927 kg 0,48 kg/hp 210 g/hp/hr 9 g/hp/hr 100/130 grade 25,1 cs 44,5 hp/lit 0,71 hp/cm ² 14,9 m/sec 14,5 kg/cm ²
Rating (take-off) 1,900 h.p./2,800 r.p.m./4 Rating (military, low) 1,750 h.p./2,600 r.p.m./3 Rating (military, high) . 1,450 h.p./2,600 r.p.m./1 Rating (normal, low) 1,600 h.p./2,400 r.p.m./5 Rating (normal, high) . 1,350 h.p./2,400 r.p.m./1 Rating (cruising) 1,050 h.p./2,100 r.p.m./n	5,000 ft. (1 000 m) 5,000 ft. (4 600 m) 5,000 ft. (1 500 m) 4,800 ft. (4 500 m) 50 specified altitude

Additional models of Wright Cyclone 14 engines will be found on page 173.



Wright Cyclone 18 R-3350

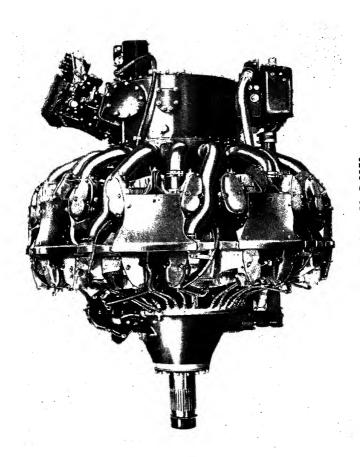
Wright Cyclone 18 R-3350

Model	eries).
Type 18 cylinders, 2-ro charged, 4-cycle.	ow radial, air cooled, geared drive, super-
W-type aluminum 1 inlet valve and 1 actuated by push	nkcase. Cylinders with steel barrels with alloy fins, and cast aluminum alloy heads. I exhaust valve (sodium cooled) per cylinder rods. 2-throw 3-piece counterbalanced crank- a 3 roller bearings. Planetary reduction gear, 56:1.
Supercharger Gear-driven 2-spee	ed supercharger, ratios 6.61:1 and 8.81:1.
	58CPB4 variable venturi pressure type down- rith automatic mixture control.
	DF18LN-1 dual magneto and 2 18-point 8-mm long reach spark plugs per cylinder. system.
Lubrication Pressure feed, 60-	-70 lb./sq.in. (4,2-4,9 kg/cm ²). Dry sump.
	E-160 or 1416 direct cranking, or Series 48 cranking, electric starter can be used.
Bore	6,85:1 1 417 mm 1 935 mm 1,57 m ² 1 211 kg 0,55 kg/hp ./hr. 210 g/hp/hr .p./hr. 9 g/hp/hr .de 100/130 grade .cs. 25,1 cs .lin. 40,1 hp/lit .lin. 0,64 hp/cm ² .in. 14,9 m/sec

670C18BA (B series): 2,200 h.p./2,800 r.p.m./take-off; 2,000 h.p./2,400 r.p.m./3,000 ft. (900 m) normal rating. Reduction gear ratio 0.44:1 or 0.56:1. 1-speed supercharger, ratio 6.06:1. 100/130 grade gasoline. Note: This 1-speed engine can be turbo-supercharged. When used in the Boeing B-19 Superfortress Army Air Forces long-range heavy bomber it is equipped with 2 General Electric turbo-superchargers.

Rating (take-off) 2,200 h.p./2,800 r.p.m./48.0 in. (1 219 mm) Hg. boost

Rating (normal, low) ... 2,000 h.p./2,400 r.p.m./4,500 ft. (1 400 m)
Rating (normal, high) ... 1,800 h.p./2,400 r.p.m./14,000 ft. (4 300 m)
Rating (cruising) 1,300 h.p./2,100 r.p.m./no specified altitude



Additional Models of Wright R-1820 (G series) Engines (Continued from page 165)

C9GB (G100 series)

R-1820 567C9GB (G102A): 1,100 h.p./2,350 r.p.m./take-off; 1,100 h.p./2,350 r.p.m./1,500 ft. (450 m) military rating; 900 h.p./2,300 r.p.m./ 6,700 ft. (2 000 m) normal rating. Reduction gear ratio 0.69:1. 1-speed supercharger, 7.0:1. 91/96 grade gasoline. A.T.C. 169.

R-1820 566C9GB (G103A): 1,000 h.p./2,350 r.p.m./take-off; 1,000 h.p./2,350 r.p.m./ 8,000 ft. (2 400 m) military rating; 860 h.p./2,300 r.p.m./ 11,100 ft. (3 400 m) normal rating. Reduction gear ratio 0.69:1.

1-speed supercharger, 8.31:1. 91/96 grade gasoline. A.T.C. 180.

R-1820 564C9GB (G105A): 1,100 h.p./2,350 r.p.m./take-off; 1,100 h.p./2,350 r.p.m./1,500 ft. (500 m) and 800 h.p./2,350 r.p.m./17,100 ft. (5 200 m) military rating; 900 h.p./2,300 r.p.m./7,700 ft. (2 300 m) and 775 h.p./2,300 r.p.m./17,300 ft. (5 300 m) normal rating. Reduction gear ratio 0.69:1. 2-speed supercharger, ratios 7.14:1 and 10.0:1. 91/96 grade gasoline. A.T.C. 192.

R-1820 718C9GB1 (G105A): Same as R-1820 564C9GB. Reduction gear 0.67:1.

C9GC (G200 series)

R-1820 702C9GC (G202A): 1,200 h.p./2,500 r.p.m./take-off; 1,200 h.p./2,500 r.p.m./4,100 ft. (1 200 m) military rating; 1,000 h.p./2,300 r.p.m./6,900 ft. (2 100 m) normal rating. Reduction gear 0.67:1.

1-speed supercharger, 7.0:1. 91/96 grade gasoline. A.T.C. 219. R-1820 728C9GC: 1,200 h.p./2,500 r.p.m./take-off; 1,000 h.p./2,300 r.p.m./6,000 ft. (1 800 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger, ratio 7.0:1. 91/96 grade gasoline. A.T.C. 219.

R-1820 730C9GC: 1,200 h.p./2,500 r.p.m./take-off; 1,000 h.p./2,300 r.p.m./6,900 ft. (2 100 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger, 7.0:1. 91/96 grade gasoline. A.T.C. 219.

R-1820 666C9GC: Similar to R-1820 702C9GC. Equipped with General Electric turbo-supercharger.

Additional Models of Wright R-2600 Engines

(Continued from page 169)

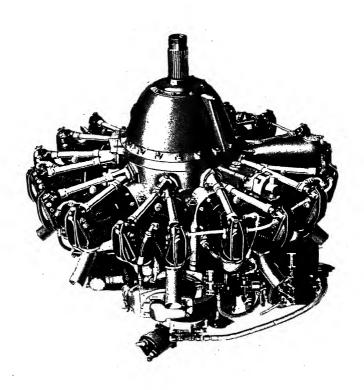
C14AC (A series)

R-2600 700C14AC (A5B): 1,600 h.p./2,400 r.p.m./take-off; 1,600 h.p./2,400 r.p.m./ 1,000 ft (300 m) and 1,400 h.p./2,400 r.p.m./10,000 ft. (3 000 m) military rating; 1,350 h.p./2,300 r.p.m./5,000 ft. (1 500 m) and 1,275 h.p./2,300 r.p.m./11,500 ft. (3 500 m) normal rating. Reduction gear ratio 0.56:1. 2-speed supercharger, ratios 7.14:1 and 10.0:1. 91/96 grade gasoline. A.T.C. pending.

C14BA (B series)

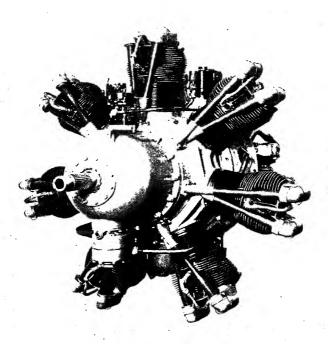
R-2600 585C14BA: 1,700 h.p./2,500 r.p.m./take-off; 1,700 h.p./2,500 r.p.m./4,100 ft. (1 200 m) military rating; 1.500 h.p./2,400 r.p.m./6,700 ft. (2 000 m) normal rating. Reduction gear ratio 0.44:1. 1-speed supercharger, ratio 7.03:1. 100/130 grade gasoline. A.T.C. 176.

R-2600 586C14BA: 1,700 h.p./2,500 r.p.m./take-off; 1,700 h.p./2,500 r.p.m./4,100 ft. (1 200 m) and 1,450 h.p./2,500 r.p.m./14,100 ft. (4 300 m) military rating; 1,500 h.p./2,400 r.p.m./6,700 ft. (2 000 m) and 1,350 h.p./2,400 r.p.m./15,000 ft. (4 600 m) normal rating. Reduction gear ratio 0.56:1. 2-speed supercharger, ratios 7.06:1 and 10.02:1. 100/130 grade gasoline. A.T.C. 176.



Alvis Leonides

Model	Model Leonides.			
Туре	9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.			
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.50:1.			
Supercharger	uperchargerGear-driven 1-speed supercharger, ratio 6.5:1.			
Carburation 1 S.U. AVT-22 2-barrel updraft carburetor with automatic boost control.				
Ignition 2 B.T.H. C2SE9-S magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.				
Lubrication Pressure feed, 80 lb./sq.in. (5,6 kg/cm ²). Dry sump.				
Starter Rotax N3EM electric inertia starter.				
Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max	4.41 in719 cu.in6.3:141.5 in52.0 in9.4 sq.ft.	122 mm 11.2 mm 11.8 lit 6,3:1 1 054 mm 1 321 mm 0,87 m ² 321 kg 0,71 kg/hp 235 g/hp/hr 3 g/hp/hr 87 octane 20,5 cs 38,1 hp/lit 0,43 hp/cm ² 11,6 m/sec 11,2 kg/cm ²		
Rating (take-off)450 h.p./3,000 r.p.m./40.1 in. (1 018 mm) Hg. boost Rating (normal)435 h.p./3,000 r.p.m./8,250 ft. (2 500 m) Rating (max. cruising)415 h.p./3,000 r.p.m./9,750 ft. (3 000 m)				

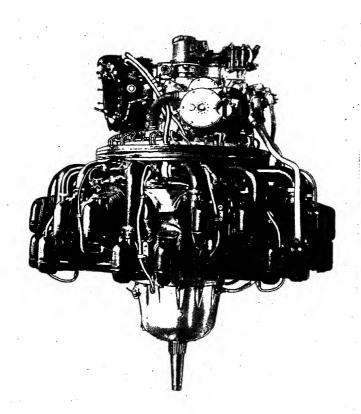


Armstrong Siddeley Cheetah

Armstrong Siddeley Cheetah

Model Cheetah XV.

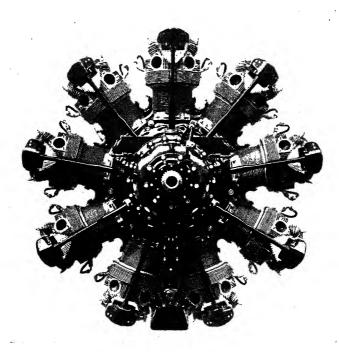
Type7 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.				
Construction1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.73:1.				
Supercharger	SuperchargerGear-driven 1-speed supercharger, ratio 6.5:1.			
Carburation 1 Hobson AV70ME updraft carburetor with 2-position automatic mixture control and automatic boost control.				
Ignition	nition			
Lubrication Pressure feed, 55-90 lb./sq.in. (3,8-6,3 kg/cm ²). Dry sump.				
Starter	Rotax N3EM electric starter.			
Fuel consumption (of Casoline grade		133 mm 140 mm 13,7 lit 6,35:1 1 212 mm 1 270 mm 1,15 m ² 365 kg 0,54 kg/hp 265 g/hp/hr 8 g/hp/hr 87 octane 20,5 cs 30,7 hp/lit 0,43 hp/cm ² 11.9 m/sec 10,9 kg/cm ²		
Rating (take-off)				
Cheetah IX:	410 h.p./2,300 r.p.m./take-off; 350 h.p./2,425 r.p.m./7,300 ft. (2 200 m) combat rating. Direct drive. 1-speed supercharger, ratio 6.5:1. 87-octane gasoline.			
Cheetah X:	410 h.p./2,300 r.p.m./take-off; 355 h.p./2,425 r.pm./7,000 ft. (2 150 m) combat rating. Direct drive. 1-speed supercharger, ratio 6.5:1. 87-octane gasoline.			
Cheetah XIX:	410 h.p./2,300 r.p.m./take-off; 380 h.p./2,300 r.p.m./4,000 ft. (1 200 m) combat rating. Direct drive. l-speed supercharger, ratio 6.5:1. 87-octane gasoline.			



Armstrong Siddeley Tiger

Model Tiger VIII.				
Type14 cylinders, 2-row radial, charged, 4-cycle.	air cooled, geared drive, super-			
Construction 1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.59:1.				
SuperchargerGear-driven 2-speed supercharger, ratios 5.34:1 and 7.96:1.				
Carburation 1 Hobson AIT87MA downdraft carburetor with 2-position automatic mixture control and boost control.				
Ignition				
Lubrication Pressure feed, 70-100 lb./sq.in. (4,9.7,0 kg/cm ²). Dry sump.				
Starter Armstrong Siddeley electric inertia starter.				
Bore	140 mm 152 mm 32,7 lit 6,2:1 1 290 mm 1 646 mm 1.31 m ² 585 kg 0,64 kg/hp 215 g/hp/hr 12 g/hp/hr 12 g/hp/hr 10 87 octane 10,32 hp/cm ² 12,4 m/sec 10,5 kg/cm ²			
Rating (take-off)				
Tiger IX: 880 h.p./2,375 r.p.m./take-off; 810 h.p./2,450 r.p.m./7,200 ft. (2 200 m) normal rating. Reduction gear ratio 0.59:1. 1-speed supercharger, ratio 5.4:1. 87-octane gasoline.				

Tiger IXc: 935 h.p./2,375 r.p.m./take-off; 805 h.p./2,375 r.p.m./6,250 ft. (1 900 m) normal rating. Reduction gear ratio 0.59:1. 1-speed supercharger, ratio 5.4:1. 87-octane gasoline.



Bristol Mercury

Bristol Mercury

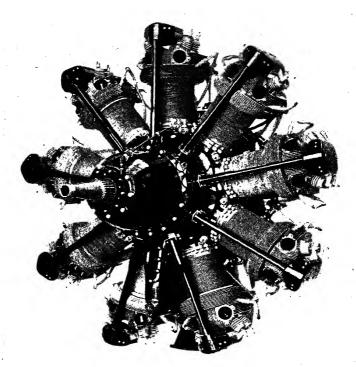
Model Mercury XV (100/130 grade).			
Type	.9 cylinders, 1-row radial, a charged, 4-cycle.	ir cooled, geared drive, super-	
Construction	Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.57:1.		
Supercharger	.Gear-driven 1-speed superchar	rger, ratio 9.4:1.	
Carburation 1 Hobson AVT-85MB 2-barrel updraft carburetor with 3-stage boost control and 2-position automatic mixture control.			
Ignition 2 B.T.H. SC9-8 or Watford SP9-6 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.			
Lubrication	Pressure feed, 80 lb./sq.in. (5	,6 kg/cm ²). Dry sump.	
StarterRotax E-160C or C-1231 electric starter.			
Compression ratio Diameter Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption (of Gasoline grade Oil grade (viscosity Output/displaceme Output/piston area Piston speed (max	6.50 in1,520 cu.in6.25:152.0 in58.5 in14.7 sq.ft.	146 mm 165 mm 24,9 lit 6,25:1 1 321 mm 1 486 mm 1,37 m ² 483 kg 0,48 kg/hp 230 g/hp/hr 10 g/hp/hr 10 g/hp/hr 100/130 grade) 20,5 cs 40,0 hp/lit 0,66 hp/cm ² 15,1 m/sec 13,1 kg/cm ²	
Rating (take-off)905 h.p./2,750 r.p.m./48.2 in. (1 225 mm) Hg. boost Rating (military)995 h.p./2,750 r.p.m./9,250 ft. (2 800 m) Rating (normal)825 h.p./2,650 r.p.m./13,000 ft. (4 000 m) Rating (cruising)590 h.p./2,400 r.p.m./16,000 ft. (4 900 m)			
Mercury XV (87-octane): 725 h.p./2,650 r.p.m./take-off; 840 h.p./2,750 r.p.m./ 14,000 ft. (4 300 m) military rating; 825 h.p./2,650 r.p.m./			

13,000 ft. (4 000 m) normal rating. Reduction gear ratio 0.572:1. 1-speed supercharger, ratio 9.4:1. 87-octane gasoline.

Mercury 25 (87-octane): Same as Mercury XV (87-octane).

Mercury 25 (100/130 grade): Same as Mercury XV (100/130 grade).

Additional models of Bristol Mercury engines will be found on page 191.



Bristol Pegasus

Bristol Pegasus

Model Pegasus XVIII (100/130 grad	e).	
Type 9 cylinders, 1-row radial, air charged, 4-cycle.	cooled, geared drive, super-	
Construction2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.50:1.		
SuperchargerGear-driven 2-speed supercharge	er, ratios 6.9:1 and 9.9:1.	
Carburation 1 Hobson AVT-85E 2-barrel up boost control and 2-position aut		
Ignition		
LubricationPressure feed, 80 lb./sq.in. (5,6	kg/cm ²). Dry sump.	
StarterRotax E-160C or C-1231 electric	starter.	
Bore .5.75 in. Stroke 7.50 in. Displacement 1.753 cu.in. Compression ratio 6.25:1 Diameter 55.3 in. Length 51.0 in. Frontal area 16.7 sq.ft. Weight 1,180 lb. Weight/horsepower 1.11 lb./h.p. Fuel consumption (cr.) 0.48 lb./h.p./hr. Oil consumption (cr.) 0.018 lb./h.p./hr. Gasoline grade 100/130 (D.E.D. 2475) Oil grade (viscosity) 100 S.U. (D.T.D. 472-B) Output/displacement 0.61 h.p./cu.in. Output/piston area 4.57 h.p./sq.in. Piston speed (max.) 3,250 ft./min. B.m.e.p. (max.) 186 lb./sq.in.	146 mm 190 mm 28,7 lit 6,25:1 1 404 mm 1 349 mm 1,55 m ² 535 kg 0,50 kg/hp 220 g/hp/hr 8 g/hp/hr 100/130 grade 20,5 cs 36,7 hp/lit 0,71 hp/cm ² 16,5 m/sec 13,1 kg/cm ²	
Rating (take-off)		
Pegasus XVIII (87-octane): 965 h.p./2,475 r.p.	p.m./take-off; 1,000 h.p./2,600	

Pegasus XVIII (87-octane): 965 h.p./2,475 r.p.m./take-off; 1.000 h.p./2,600 r.p.m./3,000 ft. (900 m) and 885 h.p./2,600 r.p.m./15,500 ft. (4 700 m) military rating; 815 h.p./2,250 r.p.m./4,750 ft. (1 400 m) and 750 h.p./2,250 r.p.m./14,750 ft. (4 400 m) normal rating. Reduction gear ratio 0.50:1. 2-speed super-charger, ratios 6.9:1 and 9.9:1. 87-octane gasoline.

Additional models of Bristol Pegasus engines will be found on page 191.



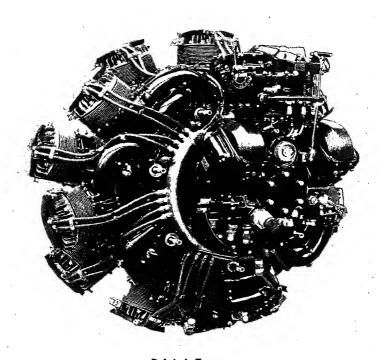
Bristol Perseus

Bristol Perseus

Model Perseus XVI.		
Type 9 cylinders, 1-row radial, air coc 4-cycle.		
Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 4-port reciprocating and oscillating single-sleeve valve per cylinder, 3 inlet ports and 2 exhaust ports around mid-section of cylinder barrel, 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.50:1.		
SuperchargerGear-driven 1-speed supercharge	r, 7.0:1.	
Carburation 1 Hobson AVT-95MB updraft carburetor with 2-position mixture control and automatic boost control.		
Ignition2 Rotax SP9-6 magnetos, 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.		
Lubrication Pressure feed, 80 lb./sq.in. (5,6 kg/cm ²). Dry sump.		
Starter Rotax E-160C electric starter.		
Bore	38,3 hp/lit 0,63 hp/cm ² 15,1 m/sec 12,7 kg/cm ²	
Rating (take-off) .905 h.p./2,750 r.p.m./37.0 in. (940 mm) Hg. boost Rating (military) .955 h.p./2,750 r.p.m./5,000 ft. (1 500 m) Rating (normal) .745 h.p./2,400 r.p.m./6,500 ft. (2 000 m) Rating (cruising) .560 h.p./2,200 r.p.m./9,000 ft. (2 700 m)		
m D : 1 D		

The Bristol Perseus develops 1,175 h.p. at take-off with 100/130 grade gasoline.

Additional models of Bristol Perseus engines will be found on page 191.



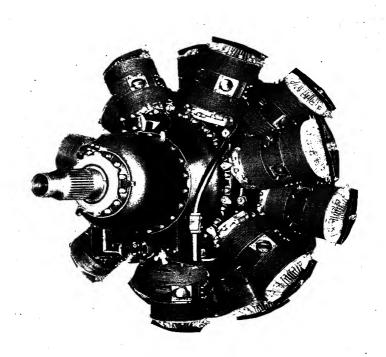
Bristol Taurus

Bristol Taurus

ModelTaurus XII.		
Type	r cooled, geared drive, super-	
Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 4-port reciprocating and oscillating single-sleeve valve per cylinder. 3 inlet ports and 2 exhaust ports around mid-section of cylinder barrel. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.44:1.		
Supercharger Gear-driven 1-speed supercharge	er, ratio 5.6:1.	
Carburation1 Hobson AIT-100M downdraft carburetor with automatic mixture control and boost control.		
Ignition 2 Rotax NST-14, Simms FST- netos. 2 14-mm long reach spa- ignition system.	-145 or Watford NST-14 mag- rk plugs per cylinder. Shielded	
Lubrication Pressure feed, 80 lb./sq.in. (5,	6 kg/cm ²). Dry sump.	
StarterRotax C-1241 electric starter.		
Bore	127 mm 143 mm 25,4 lit 7,2:1 1 173 mm 1,488 mm 1,09 m² 605 kg 0,53 kg/hp 195 g/hp/hr 10 g/hp/hr 100/130 grade 20,5 cs 44,5 hp/lit 0,64 hp/cm² 14,8 m/sec 13,1 kg/cm²	
Rating (take-off)1,085 h.p./3,100 r.p.m./39.6 in. (1 005 mm) Hg. boost Rating (military)1,130 h.p./3,100 r.p.m./3,500 ft. (1 100 m) Rating (normal)985 h.p./2,800 r.p.m./3,750 ft. (1 100 m) Rating (max. cruising)700 h.p./2,500 r.p.m./7,250 ft. (2 200 m)		

Taurus II: Same as Taurus XII.

Taurus VI, XVI: Same as Taurus XII. 1-speed supercharger, ratio 7.5:1.



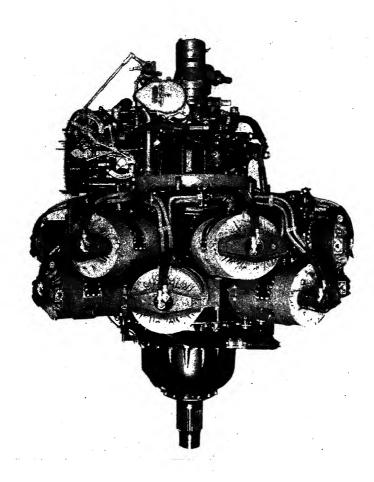
Bristol Hercules

Bristol Hercules

Model Hercules XVI.		
Type	r cooled, geared drive, super-	
Construction 3-piece forged aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 4-port reciprocating and oscillating single-sleeve valve per cylinder. 3 inlet ports and 2 exhaust ports around mid-section of cylinder barrel. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.44:1.		
SuperchargerGear-driven 2-speed supercharge	r, ratios 6.68:1 and 8.35:1.	
Carburation 1 Hobson AIT-132M or AIT-13 retor with automatic mixture co		
Ignition 2 B.T.H., Rotax or Simms magnetos. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.		
Lubrication Pressure feed, 80 lb./sq.in. (5,6	kg/cm ²). Dry sump.	
StarterRotax C-1231 electric starter.		
Bore	146 mm 165 mm 38,7 lit 7,0:1 1 321 mm 1 778 mm 1,37 m² 857 kg 0,51 kg/hp 205 g/hp/hr 8 g/hp/hr 100/130 grade 20,5 cs 43,3 hp/lit 0,71 hp/cm² 15,9 m/sec 13,6 kg/cm²	
Rating (take-off) 1,615 h.p./2,900 r.p.m./46.7 in. (1 186 mm) Hg. boost Rating (military, low) 1,675 h.p./2,900 r.p.m./4,500 ft. (1 400 m) Rating (military, high) 1,455 h.p./2,900 r.p.m./12,000 ft. (3 700 m) Rating (normal, low) 1,355 h.p./2,400 r.p.m./4,750 ft. (1 400 m) Rating (normal, high) 1,240 h.p./2,400 r.p.m./12,000 ft. (3 700 m) Rating (cruising, low) 1,050 h.p./2,400 r.p.m./10,250 ft. (3 100 m) Rating (cruising, high) 955 h.p./2,400 r.p.m./17,250 ft. (5 300 m)		

Hercules VI: Same as Hercules XVI.

Additional models of Bristol Hercules engines will be found on page 191.



Additional Models of Bristol Mercury Engines

(Continued from page 181)

Mercury XX: 820 h.p./2,650 r.p.m./take-off; 870 h.p./2,750 r.p.m./4,500

ft. (1 400 m) military rating; 810 h.p./2,400 r.p.m./2,500 ft. (800 m) normal rating. Reduction gear ratio 0.572:1. 1-speed supercharger, ratio 9.4:1. 87-octane gasoline.

950 h.p./2,750 r.p.m./take-off; 995 h.p./2,750 r.p.m./ Mercury 30:

18,000 ft. (5 500 m) military rating. Reduction gear ratio 0.57:1. 1-speed supercharger, ratio 9.4:1. 100/130

grade gasoline.

Additional Models of Bristol Pegasus Engines

(Continued from page 183)

Pegasus VI: 815 h.p./2,425 r.p.m./take-off; 840 h.p./2,525 r.p.m./

1,250 ft. (400 m) military rating; 690 h.p./2,200 r.p.m./ 3,500 ft. (1 100 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger, ratio 7.0:1. 87-octane gaso-

line. Equipped for pusher propeller.

1,010 h.p./2,600 r.p.m./take-off; 865 h.p./2,600 r.p.m./ Pegasus 22, 23:

6,500 ft. (2 000 m) military rating; 825 h.p./2,250 r.p.m./ 4,000 ft. (1 200 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, 7.0:1. 87-octane gasoline.

Additional Models of Bristol Perseus Engines

(Continued from page 185)

930 h.p./2,750 r.p.m./take-off; 935 h.p./2,650 r.p.m./5,500 Perseus Xa:

ft. (1 700 m) military rating; 860 h.p./2,400 r.p.m./2,750 ft. (800 m) normal rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 7.8:1. 87-octane gasoline.

830 h.p./2,650 r.p.m./take-off; 905 h.p./2,750 r.p.m./6,500 Perseus XI, XII:

ft. (2 000 m) military rating; 745 h.p./2,400 r.p.m./ 6,500 ft. (2 000 m) normal rating. Reduction gear ratio

0.50:1. 1-speed supercharger, 7.0:1. 87-octane gasoline. 830 h.p./2,700 r.p.m./take-off; 815 h.p./2,600 r.p.m./6,000 Perseus XIIc, XIVc: ft. (1800 m) normal rating. Reduction gear ratio 0.50:1.

1-speed supercharger, ratio 7.0:1. 87-octane gasoline.

Additional Models of Bristol Hercules Engines

(Continued from page 189)

Hercules VII: Same as Hercules XVII.

Hercules XI: 1,560 h.p./2,800 r.p.m./take-off; 1,560 h.p./2,800 r.p.m./

sea level and 1,460 h.p./2,800 r.p.m./9,500 ft. (2 900 m) military rating; 1,310 h.p./2,500 r.p.m./2,000 ft. (600 m) and 1,185 h.p./2,500 r.p.m./12,750 ft. (3 900 m) normal rating. Reduction gear ratio 0.44:1. 2-speed supercharger,

ratios 5.37:1 and 7.56:1. 100/130 grade gasoline.

Hercules XVII: 1,725 h.p./2,900 r.p.m./take-off; 1,735 h.p./2,900 r.p.m./ 500 ft. (150 m) military rating; 1,395 h.p./2,400 r.p.m./

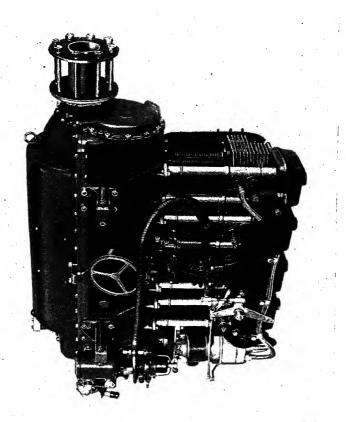
1.500 ft. (500 m) normal rating. Reduction gear ratio 0.44:1. 2-speed supercharger, ratios 6.68:1 and 8.35:1, with high gear sealed out of operation, 100/130 grade

gasoline.

Hercules XVIII: 1,725 h.p./2,900 r.p.m./take-off; 1,735 h.p./2,900 r.p.m./

500 ft. (150 m) and 1.565 h.p./2,900 r.p.m./8,000 ft. (2 400 m) military rating; 1,395 h.p./2,400 r.p.m./1,500 ft. (500 m) and 1,300 h.p./2,400 r.p.m./8,250 ft. (2 500 m) normal rating. Reduction gear ratio 0.44:1. 2-speed supercharger, ratios 6.68:1 and 8.35:1. 100/130 grade

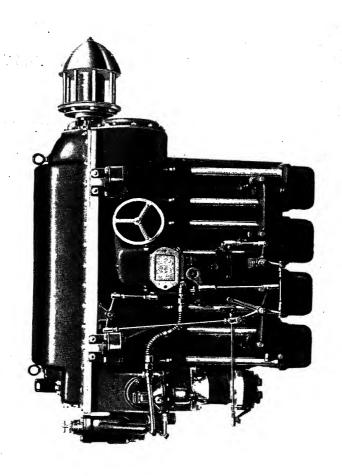
gasoline.



Cirrus Minor (Series I)

Model	Cirrus Minor I.		
Type	4 cylinders, inverted in-line, air cooled, direct drive, not super-charged, 4-cycle.		
Construction	onstruction1-piece elektron crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.		
Supercharger	None.		
	1 Hobson AI40 downdraft car Amal flame trap.	buretor with altitude control.	
Ignition 2 B.T.H. SG42 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication	Pressure feed, 23-35 lb./sq.in. (1,6 - 2,5 kg/cm ²). Dry sump.	
Starter	B.T.H. electric starter.	•	
Fuel consumption (Oil consumption (Coasoline grade Oil grade (viscosity Output/displacement Output/piston area Piston speed (max.	5.00 in220 cu.in5.8:117.3 in25.0 in37.8 in2.7 sq.ft.	95 mm 127 mm 3,6 lit 5,8:1 440 mm 635 mm 960 mm 0,25 m ² 94 kg 1,05 kg/hp 245 g/hp/hr 8 g/hp/hr) 73 octane 20,5 cs 25,0 hp/lit 0,32 hp/cm ² 11,0 m/sec 8,8 kg/cm ²	
Rating (normal) .	90 h.p./2,600 r.p.m. 82 h.p./2,300 r.p.m./sea l 78 h.p./2,200 r.p.m./sea l	level level	

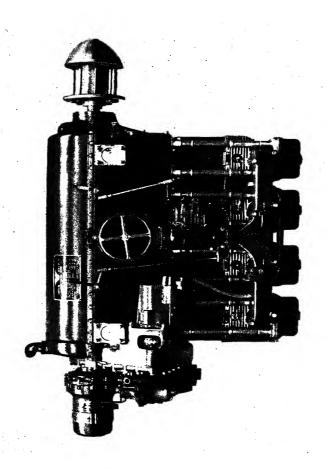
Manufactured by Cirrus Engine Section of Blackburn Aircraft Limited.



Cirrus Minor (Series II)

Model Cirrus Minor II.			
Type			
	Construction 2-piece elektron crankcase divided horizontally. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.		
Supercharger	None.		
Carburation	1 Zenith downdraft carburetor. A	amal flame trap.	
Ignition 2 B.T.H. SG4-2 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system optional.			
Lubrication Pressure feed, 23-35 lb./sq.in. (1,6-2,5 kg/cm ²). Dry sump.			
Starter	Optional. B.T.H. electric starter	can be used.	
Oil consumption (cr. Gasoline grade Oil grade (viscosity Output/displacemen Output/piston area Piston speed (max.) B.m.e.p. (max.)		100 mm 127 mm 4,0 lit 6,25:1 455 mm 650 mm 965 mm 0,27 m² 112 kg 1,12 kg/hp 215 g/hp/hr 8 g/hp/hr 73 octane 20,5 cs 25,0 hp/lit 0,32 hp/cm² 11,0 m/sec 8,8 kg/cm²	
Rating (take-off)100 h.p./2,600 r.p.m. Rating (normal)90 h.p./2,300 r.p.m./sea level Rating (cruising)80 h.p./2,200 r.p.m./sea level			

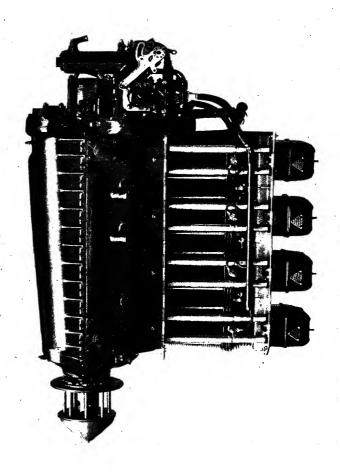
Manufactured by Cirrus Engine Section of Blackburn Aircraft Limited.



Cirrus Major

Model Cirrus Major I.		
Type4 cylinders, inverted in-line, air-cooled, direct drive, not super-charged, 4-cycle.		
Constructionl-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.		
Supercharger None.		
Carburation 1 Hobson	AI48G downdraft car	buretor with altitude control
Ignition 2 Simms FTD-4U magnetos. 2 14-mm short reach spark plugs per cylinder.		
Lubrication Pressure fe	ed, 30-40 lb./sq.in. (2,1 - 2,8 kg/cm ²). Dry sump.
Starter B.T.H. elec		
Bore 4.72 Stroke 5.50 Displacement 386 Compression ratio 5.8:1 Width 17.0 Height 30.0 Length 42.9 Frontal area 4.2 s Weight 325 Weight/horsepower 2.17 Fuel consumption (cr.) 0.54 Oil consumption (cr.) 0.010 Gasoline grade 73 oc Oil grade (viscosity) 100 Output/displacement 0.39 Output/piston area 2.14 Piston speed (max.) 2,246 B.m.e.p. (max.) 126	in. cu.in. in. in. in. ig.ft. lb. lb./h.p./hr. lb./h.p./hr. tane (RDE/F/73 OS) S.U. (D.T.D. 472-B) h.p./cu.in. h.p./sq.in. f.ft./min.	120 mm 140 mm 6,3 lit 5,8:1 433 mm 761 mm 1 090 mm 0,39 m² 147 kg 0,98 kg/hp 245 g/hp/hr 5 g/hp/hr 73 octane 20,5 cs 23,8 hp/lit 0,33 hp/cm² 11,4 m/sec 8,9 kg/cm²
Rating (take-off)150 h.p./2,450 r.p.m. Rating (normal)138 h.p./2,200 r.p.m./sea level Rating (cruising)134 h.p./2,100 r.p.m./sea level		
Cirrus Major II: Same as Cirrus Major I. Weighs 338 lb. (153 kg.)		

Manufactured by Cirrus Engine Section of Blackburn Aircraft Limited.



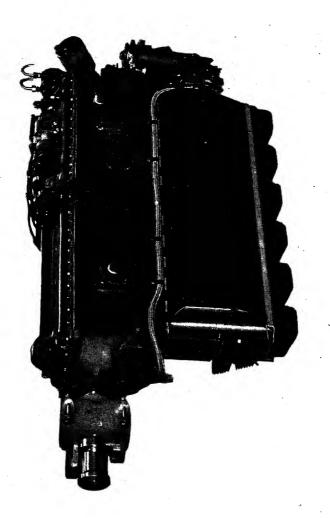
De Havilland Gipsy Major

Model		
Type		
Construction2-piece magnesium alloy crankcase. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings. Equipped for fixed pitch propeller.		
SuperchargerNone.		
Carburation 1 Hobson AI48 downdraft c control.	arburetor with manual mixture	
Ignition 2 B.T.H. AG4-4 magnetos. 2 12-mm short reach spark plugs per cylinder.		
Lubrication Pressure feed, 40-45 lb./sq.in.	(2,8-3,2 kg/cm ²). Dry sump.	
StarterNone.		
Bore	118 mm 140 mm 6,1 lit 5,25:1 508 mm 752 mm 1 227 mm 0,35 m² 138 kg 1,06 kg/hp 210 g/hp/hr 9 g/hp/hr 73 octane 20,5 cs 21,3 hp/lit 0,30 hp/cm² 11,0 m/sec 8,3 kg/cm²	
Rating (take-off)		
Gipsy Major IC: 140 h.p./2,400 r.p.m./take-off; 130 h.p./2,100 r.p.m./sea level normal rating. Direct drive. Not supercharged. 80-octane gasoling.		

Gipsy Major II: Same as Gipsy Major IC. Equipped for variable pitch propeller.
Uses 14-mm short reach spark plugs.

line. Equipped for fixed pitch propeller.

Gipsy Major III: 160 h.p./2,500 r.p.m./take-off: 156 h.p./2,400 r.p.m./sea level normal rating. Direct drive. Not supercharged. 80-octane gasoline.



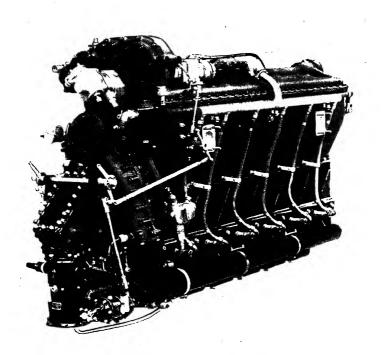
De Havilland Gipsy Six II

Model	Model		
Type	Type		
Construction1-piece magnesium alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece crankshaft supported in 7 plain bearings. Equipped for variable pitch propeller.			
Supercharger	. None.		
Carburation 2 Hobson AI48F downdraft carburetors with automatic mixture control.			
Ignition 2 B.T.H. MC1-1 magnetos. 2 14-mm short reach spark plugs per cylinder.			
Lubrication	. Pressure feed. 40-45 lb./sq.in.	(2,8-3,2 kg/cm ²). Dry sump.	
Starter	. Rotax N3EY hand or electric sta	rter.	
Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)	5.50 in558 cu.in558 cu.in60:119.1 in31.7 in63.5 in3.8 sq.ft503 lb. r2.40 lb./h.p. (cr.) 0.46 lb./h.p./hr. cr.) 0.024 lb./h.p./hr. cr.) 0.024 lb./h.p./hr. dr.) 100 S.U. (D.T.D. 224) y) 100 S.U. (D.T.D. 472-B) nt 0.38 h.p./cu.in. r. 2.06 h.p./sq.in. r. 2,200 ft./min125 lb./sq.in.	118 mm 140 mm 9,1 lit 6,0:1 485 mm 805 mm 1 613 mm 0,35 m ² 228 kg 1,09 kg/hp 210 g/hp/hr 11 g/hp/hr 80 octane 20,5 cs 22,8 hp/lit 0,32 hp/cm ² 11,2 m/sec 8,8 kg/cm ²	
Rating (take-off)210 h.p./2,400 r.p.m. Rating (normal)185 h.p./2,100 r.p.m./sea level Rating (cruising)145 h.p./2,100 r.p.m./sea level			
	osyqueen III): 200 h.p./2,350		

r.p.m./sea level normal rating. Direct drive. Not supercharged. 73-octane gasoline. Equipped for fixed pitch propeller.

Gipsy Six II (Gipsyqueen I): Same as Gipsy Six II (Gipsyqueen II). Equipped for fixed pitch propeller.

These engines are known by the name Gipsyqueen when used in Royal Air Force aircraft.

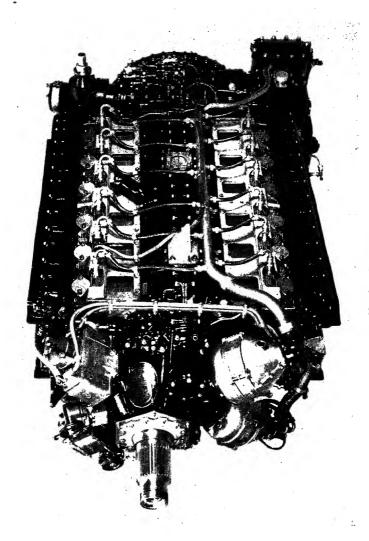


De Havilland Gipsy Six IIIS

De Havilland Gipsy Six IIIS

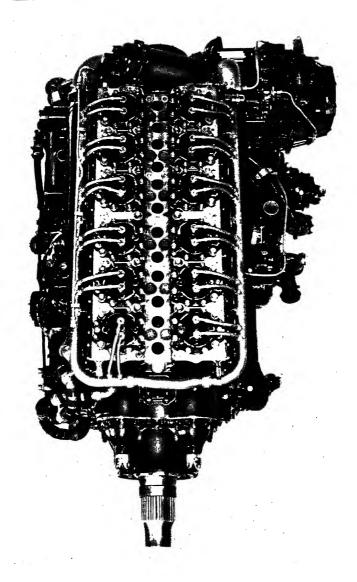
Model Gipsy Six IIIS (Gipsyqueen I	IV).	
Type 6 cylinders, inverted in-line, as charged, 4-cycle.	ir cooled, direct drive, super-	
Construction l-piece magnesium alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Equipped for constant speed propeller.		
SuperchargerGear-driven 1-speed supercharge	er, ratio 11.16:1.	
Carburation 1 Hobson AV70M updraft carburetor with automatic boost control and mixture control.		
Ignition 2 B.T.H. MC1-2 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication Pressure feed, 45 lb./sq.in. (3,2	2 kg/cm ²). Dry sump.	
Starter Rotax N3EY hand or electric sta	arter.	
Frontal area	120 mm 150 mm 10,2 lit 6,2:1 419 mm 856 mm 1 639 mm 0,32 m ² 254 kg 0,89 kg/hp 280 g/hp/hr 12 g/hp/hr 87 octane 20,5 cs 28,0 hp/lit 0,42 hp/cm ² 12,5 m/sec 10,3 kg/cm ²	
Rating (take-off)		

This engine is known by the name Gipsyqueen when used in Royal Air Force aircraft.



Napier Dagger

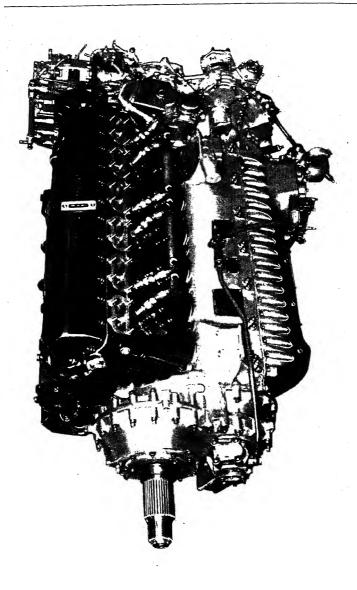
Model	Dagger VIII.		
Type	e		
Construction	onstruction 2-piece aluminum alloy crankcase divided horizontally. Cylinders with steel barrels and detachable aluminum alloy heads. I inlet valve and I exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 2 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.31:1.		
Supercharger	Supercharger Gear-driven 1-speed supercharger, ratio 5.07:1. Double-entry impeller.		
Carburation	Carburation 1 S.U. AVT-30N1 2-barrel updraft carburetor with 2-position mixture control and automatic boost control.		
Ignition 2 B.T.H. CSE12-12S magnetos and 2 B.T.H. 24-point distributors. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication	Pressure feed, 50 lb./sq.in. (3,5	kg/cm ²). Dry sump.	
Starter	Rotax 12VE-160C electric starter.		
Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption (of Casoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		97 mm 95 mm 16,8 lit 7,5:1 584 mm 1 143 mm 2 032 mm 0,49 m ² 630 kg 0,63 kg/hp 210 g/hp/hr 5 g/hp/hr 87 octane 20,5 cs 59,5 hp/lit 0,65 hp/cm ² 13,3 m/sec 12,9 kg/cm ²	
Rating (take-off) .955 h.p./4,200 r.p.m./42.1 in. (1 070 mm) Hg. boost Rating (military) .1,000 h.p./4,200 r.p.m./8,750 ft. (2 700 m) Rating (normal) .920 h.p./4,000 r.p.m./9,000 ft. (2 700 m) Rating (cruising) .620 h.p./3,500 r.p.m./12,250 ft. (3 700 m)			



Napier Sabre

Model Sabre IIA.			
	24 cylinders, horizontal H with 4 banks, pressure water cooled, geared drive, supercharged, 4-cycle.		
changeable aluminum alloy cyli upper and 6 lower cylinder bor der blocks attached horizontally and 26 studs. Individual jacket 1 4-port reciprocating single-sle ports and 2 exhaust ports per cy shafts supported in 7 plain bear	cuction 2-piece aluminum alloy crankcase divided vertically. 2 interchangeable aluminum alloy cylinder blocks each containing 6 upper and 6 lower cylinder bores. Steel cylinder liners. Cylinder blocks attached horizontally to crankcase by 12 tie bolts and 26 studs. Individual jacketed detachable cylinder heads. 1 4-port reciprocating single-sleeve valve per cylinder. 3 inlet ports and 2 exhaust ports per cylinder. 2 6-throw 1-piece crankshafts supported in 7 plain bearings. Compound helical reduction gear, ratio 0.274:1. Equipped for De Havilland Hydromatic propeller.		
SuperchargerGear-driven 2-speed supercharger, ratios 4.48:1 and 6.26:1. Double entry impeller. Automatic boost control.			
Carburation 1 S.U. AVQ-30/200 4-barrel updraft carburetor with automatic mixture control and altitude control.			
Ignition 2 B.T.H. CISE-ES duplex magnetos and 2 B.T.H. 24-point distributors. 2 14-mm long reach spark plugs per cylinder. Shielded ignition system.			
Lubrication Pressure feed, 60-90 lb./sq.in.	4,2-6,3 kg/cm ²). Dry sump.		
Starter Plessy Coffman L-4S combustion type starter with 5-cartridge magazine.			
Bore	127 mm 120 mm 36,7 lit 7,0:1 1 016 mm 1 297 mm 2 059 mm 0,93 m ² 1 070 kg 0,48 kg/hp 210 g/hp/hr 7 g/hp/hr 100/130 grade 20,5 cs 60,0 hp/lit 0,72 hp/cm ² 14,8 m/sec 14,7 kg/cm ²		

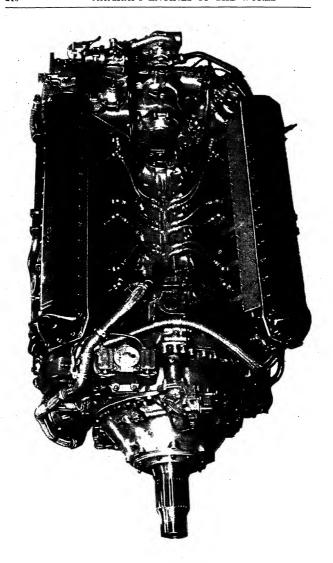
Sabre IIB: 2,400 h.p./take-off. All other data restricted, January, 1945.



Rolls-Royce Peregrine

Model	Peregrine I.		
Type	.12 cylinders, vee 60 degrees, drive, supercharged, 4-cycle.	pressure water cooled, geared	
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.47:1.		
Supercharger	Gear-driven 1-speed supercharger, ratio 9.5:1.		
Carburation	ration 1 S.U. AIT-32 downdraft carburetor with 2-position automatic mixture control and progressive boost control.		
Ignition 2 B.T.H. C5SE-12S magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication Pressure feed, 60-70 lb./sq.in. (4,2-4,9 kg/cm ²). Dry sump.			
Starter	Rotax N3ET electric starter.		
Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		127 mm 140 mm 21,2 lit 6,0:1 688 mm 1 012 mm 1 870 mm 0,46 m² 502 kg 0,52 kg/hp 220 g/hp/hr 9 g/hp/hr 100/130 grade 20,5 cs 45,3 hp/lit 0,63 hp/cm² 14,0 m/sec 13,0 kg/cm²	
Rating (take-off)			

Peregrine II: Same as Peregrine I. Propeller rotates in opposite direction.

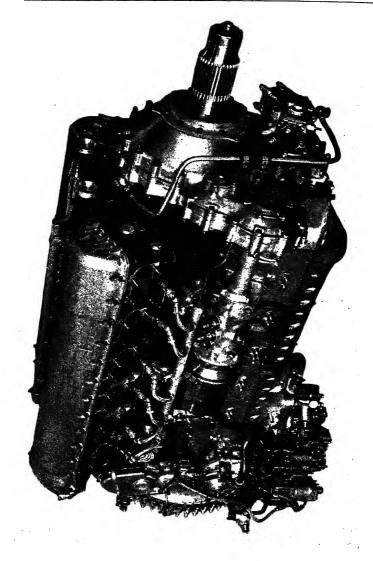


Rolls-Royce Vulture

ModelVulture I.			
Type24 cylinders, X 90 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.			
Construction2-piece aluminum alloy crankcase. 4 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 12-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.35:1.			
SuperchargerGear-driven 2-speed supercharger, ratios 5.46:1 and 7.28:1. 2 intake manifolds each supplying 2 blocks of cylinders.			
Carburation 1 S.U. AIT-48 2-barrel downdraft carburetor with 2-position automatic mixture control and progressive boost control.			
Ignition 2 Rotax NG2-1 magnetos and 2 Rotax ND24-1 24-point distributors. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication Pressure feed, 70 lb./sq.in. (4,9 kg/cm ²). Dry sump.			
Starter Rotax C-1501 electric starter.			
Bore .5.00 in. 127 mm Stroke 5.50 in. 140 mm Displacement 2,592 cu.in. 42,4 lit Compression ratio .60:1 6,0:1 Width 35.8 in. 909 mm Height 42.3 in. 1 075 mm Length 78.0 in. 1 981 mm Frontal area 8.0 sq.ft. 0,74 m² Weight 2,450 lb. 1 111 kg Weight/horsepower 1.21 lb./h.p. 0,55 kg/hp Fuel consumption (cr.) 0.48 lb./h.p./hr. 220 g/hp/hr Oil consumption (cr.) 0.022 lb./h.p./hr. 10 g/hp/hr Gasoline grade 100/130 (D.E.D. 2475) 100/130 grade Oil grade (viscosity) 100 S.U. (D.T.D. 472-B) 20,5 cs Output/displacement 0.77 h.p./cu.in. 47,4 hp/lit Output/piston area 4.27 h.p./sq.in. 0,66 hp/cm² Piston speed (max.) 2,750 ft./min. 14,0 m/sec B.m.e.p. (max.) 203 lb./sq.in. 14,3 kg/cm²			
Rating (take-off)			
Note: This engine has the same cylinder blocks as the Rolls-Royce Peregrine from which it was developed.			

Vulture II: Same as Vulture I. Propeller rotates in opposite direction.

Vulture IV: Similar to Vulture I and II.



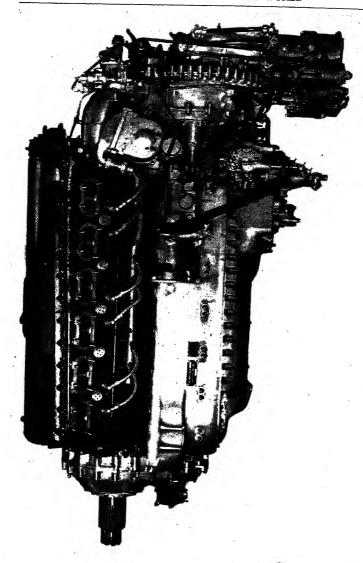
Rolls-Royce Merlin (1-speed 1-stage)

	, ,			
Model	Merlin 45.			
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.			
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.48:1.			
Supercharger	Supercharger Gear-driven 1-speed supercharger, ratio 9.1:1.			
Carburation 1 S.U. AVT-40 2-barrel updraft carburetor with automatic mixture control and boost control.				
Ignition 2 B.T.H. C5SE12-S or Rotax NES12-4 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.				
Lubrication Pressure feed, 70 lb./sq.in. (4,9 kg/cm ²). Dry sump.				
Starter	B.T.H. CA-4570 electric starter.			
Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption (of Gasoline grade Oil grade (viscosity Output/displaceme Output/piston area Piston speed (max.	6.00 in1,649 cu.in6.0:129.8 in41.2 in70.6 in5.8 sq.ft.	137 mm 152 mm 27.0 lit 6,0:1 757 mm 1 046 mm 1 793 mm 0,54 m ² 623 kg 0,41 kg/hp 235 g/hp/hr 10 g/hp/hr 100/130 grade 20,5 cs 56,1 hp/lit 0,85 hp/cm ² 15,2 m/sec 17,1 kg/cm ²		
Rating (take-off) .1,185 h.p./3,000 r.p.m./54.3 in. (1 380 mm) Hg. boost Rating (military) .1,515 h.p./3,000 r.p.m./11,000 ft. (3 400 m) Rating (normal) .1,200 h.p./2,850 r.p.m./16,000 ft. (4 900 m) Rating (cruising) .1,060 h.p./2,650 r.p.m./14,500 ft. (4 400 m)				
Merlin 30:	Similar to Merlin 45. 1,260 h.p./	'3,000 r.p.m./take-off.		
Merlin 32:	Similar to Merlin 45. Detachable ratio 0.48:1. 1-speed 1-stage su	percharger, ratio 8.588:1. Car-		

tridge type starter. 100/130 grade gasoline. Develops maximum power at take-off and at low altitudes. Used by Fleet Air Arm in carrier-based aircraft. See photograph on opposite page. All other data restricted, January, 1945.

Merlin 46: 1,100 h.p./3,000 r.p.m./take-off; 1.415 h.p./3,000 r.p.m./14,000 ft. (4 300 m) military rating; 1,115 h.p./2,830 r.p.m./19,000 ft. (5 800 m) normal rating. Reduction gear ratio 0.48:1. 1-speed 1-stage supercharger, ratio 9.1:1. 100/130 grade gasoline.





Rolls-Royce Merlin (2-speed 1-stage)

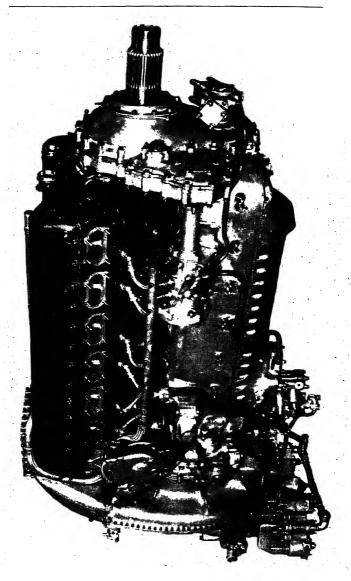
Model Merlin XX.			
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.		
onstruction2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.42:1.			
Supercharger Gear-driven 2-speed supercharger, ratios 8.15:1 and 9.49:1.			
Carburation 1 S.U. AVT-40 2-barrel updraft carburetor with automatic mixture control and boost control.			
Ignition 2 B.T.H. C5SE12-S or Rotax NES12-4 magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication Pressure feed, 70 lb./sq.in. (4,9	kg/cm ²). Dry sump.		
Starter B.T.H. CA-4750 electric starter.			
Bore	137 mm 152 mm 27,0 lit 6,0:1 757 mm 1 046 mm 1 793 mm 0,54 m ² 658 kg 0,44 kg/hp 235 g/hp/hr 10 g/hp/hr 100/130 grade 20,5 cs 54,8 hp/lit 0,83 hp/cm ² 15,2 m/sec 16,7 kg/cm ²		
Rating (take-off)			
(1 600 m) and 1,010 h.p./3,0 military rating; 1,035 h.p./2,60	; 1,130 h.p./3,000 r.p.m./5,250 ft. 00 r.p.m./17,750 ft. (5 400 m) 100 r.p.m./2,250 ft. (700 m) and		

6.39:1 and 8.75:1. 87-octane gasoline. Merlin 21, 22, 23, 25: Similar to Merlin XX.

Merlin 28, 29, 31, 33, 38: Similar to Merlin XX. Built by Packard Motor Car Company in the United States of America. See page 123.

960 h.p./2,600 r.p.m./13,000 ft. (4 000 m) normal rating. Reduction gear ratio 0.42:1. 2-speed 1-stage supercharger, ratios

Merlin 55: Similar to Merlin XX.



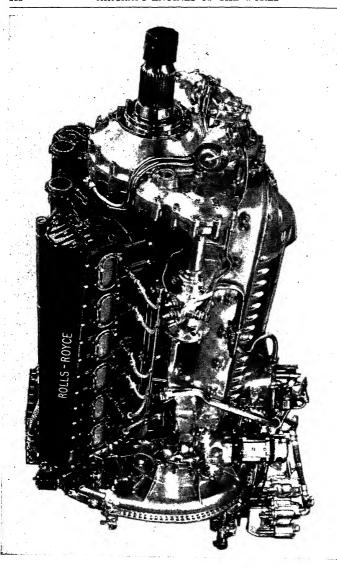
Rolls-Royce Merlin (2-speed 2-stage)

Model	Merlin 61.		
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.		
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with a detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.42:1.		
Supercharger	Gear-driven 2-speed 2-stage supercharger, ratios 6.39:1 and 8.03:1. Water-cooled inter-stage passages. Water-cooled after-cooler.		
Carburation 1 S.U. AVT-44 2-barrel updraft carburetor with automatic mixture control and progressive boost control.			
Ignition			
Lubrication Pressure feed, 70 lb./sq.in. (4,9 kg/cm ²). Dry sump.			
Starter B.T.H. CA-4750 electric starter.			
Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosi) Output/displaceme Output/piston area Piston speed (max.)		137 mm 152 mm 27,0 lit 6,0:1 757 mm 1 145 mm 1 981 mm 0,57 m² 744 kg 0,47 kg/hp 245 g/hp/hr 10 g/hp/hr 10 g/hp/hr 10 0/130 grade 20,5 cs 58,1 hp/lit 0,88 hp/cm² 15,2 m/sec 17,6 kg/cm²	
Rating (take-off) 1,290 h.p./3,000 r.p.m./54.3 in. (1 380 mm) Hg. boost Rating (military, high) 1,570 h.p./3,000 r.p.m./11,500 ft. (3 500 m) Rating (military, low) 1,390 h.p./3,000 r.p.m./23,500 ft. (7 200 m) Rating (normal, high) 1,400 h.p./2,850 r.p.m./12,000 ft. (3 700 m) Rating (normal, low) 1,250 h.p./2,850 r.p.m./24,000 ft. (7 300 m) Rating (cruising, high) 1,090 h.p./2,650 r.p.m./16,000 ft. (4 900 m) Rating (cruising, low)			

The latest model of the Merlin 61 has a maximum rating of more than $1.650\ h.p./3,000\ r.p.m.$

Note: Sea-level atmospheric pressure is maintained in the intake manifolds of this engine to an altitude of more than 40,000 ft. (12 $200~{\rm m}$).





Rolls-Royce Merlin (2-speed 2-stage)

Model Merlin	n 63.		
	.12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.		
blocks liners. cylind baland	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with a detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counter- balanced crankshaft supported in 7 plain bearings. Spur re- duction gear, ratio 0.477:1.		
	. Water-cooled inter-stage	percharger, ratios 6.39:1 and passages. Water-cooled after-	
Carburation 1 S.U. AVT-44 2-barrel updraft carburetor with automatic mixture control and progressive boost control.			
Ignition			
Lubrication Pressu	re feed, 55-70 lb./sq.in. (3,9 - 4,9 kg/cm ²). Dry sump.	
Starter B.T.H	. CA-4750 electric starter.		
Bore Stroke Displacement Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption (cr.) Oil consumption (cr.) Oil grade (viscosity) Output/displacement Output/piston area Piston speed (max.) B.m.e.p. (max.)	.6.00 in. 1,649 cu.in. 6.0:1 .29.8 in. 45.1 in. 78.0 in. 6.1 sq.ft. 1,665 lb. 1.01 lb./h.p. 0.54 lb./h.p./hr. 1.00/130 (D.E.D. 2475) 1.00 S.U. (D.T.D. 472-B) 1.00 h.p./cu.in. 3,000 ft./min.	137 mm 152 mm 27,0 lit 6,0:1 757 mm 1 145 mm 1 1981 mm 0,57 m² 755 kg 0,46 kg/hp 245 g/hp/hr 100/130 grade 20,5 cs 61,1 hp/lit 0,93 hp/cm² 15,2 m/sec 18,6 kg/cm²	
Rating (maximum)	. More than 1,650 h.p./3 stricted, January, 1945.	,000 r.p.m. All other data re-	

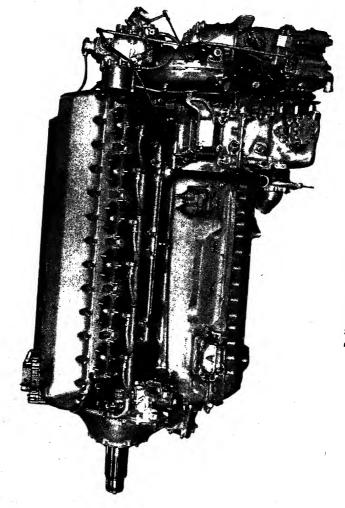
Merlin 63A: Same as Merlin 63.

Merlin 72, 73: Similar to Merlin 63, 1,750 h.p./3,000 r.p.m./take-off.

Merlin 76, 77: Similar to Merlin 72, 73.

Note: Sea-level atmospheric pressure is maintained in the intake manifolds of these engines to an altitude of more than 40,000 ft. (12 200 m).



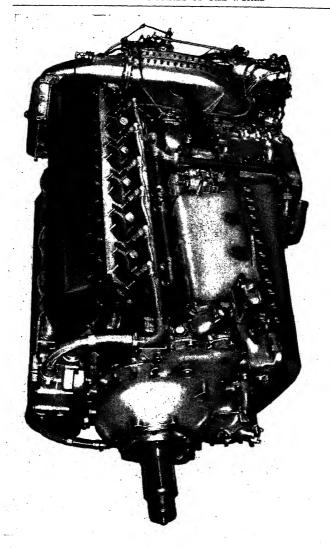


Rolls-Royce Griffon (1-stage)

Rating (maximum) More than 1,750 h.p./2,750 r.p.m. All other data restricted, January, 1945.

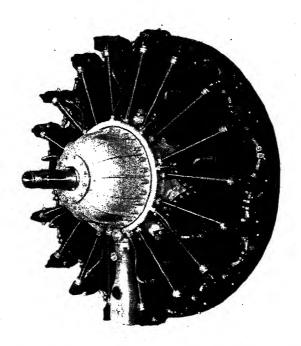
Griffon II: Similar to Griffon IV.

Note: The Rolls-Royce Griffon has the same displacement as the Rolls-Royce R racing engine which won the Schneider Trophy outright in 1931. The R engine was rated at 2,600 h.p./3,000 r.p.m./sea level at 67.0 in. (1 702 mm) Hg. boost with a b.m.e.p. of 310 lb./sq.in. (21,8 kg/cm²), using 92-octane gasoline.



Rolls-Royce Griffon (2-stage)

Model Griffon 65.			
Type	12 cylinders, vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.		
blocks with a detachable head liners. 2 inlet valves and 2 e per cylinder actuated by over counterbalanced crankshaft sup reduction gear, ratio 0.45:1 or	ction 2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with a detachable head for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.45:1 or 0.51:1. Rotol remote drive gear box for accessories. Equipped for Rotol 5-blade constant speed		
Supercharger Gear-driven 2-speed 2-stage supercharger, ratios 5.84:1 and 7.58:1. Automatic gear change at critical altitude. Water-cooled inter-stage passages. Water-cooled aftercooler.			
Carburation 1 S.U. AVT-140 2-barrel updraft carburetor with automatic mixture control and progressive boost control.			
Ignition 1 B.T.H. CSH12-12S/4 dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication Pressure feed, 45-60 lb./sq.in. (3,2-4,2 kg/cm²). Direct feed to all crankshaft main bearings. Dry sump.			
Starter			
Bore	54,5 hp/lit 0.91 hp/cm ² 15,4 m/sec 18,0 kg/cm ²		



Commonwealth Aircraft Pratt & Whitney Wasp R-1340

Commonwealth Aircraft Pratt & Whitney Wasp R-1340

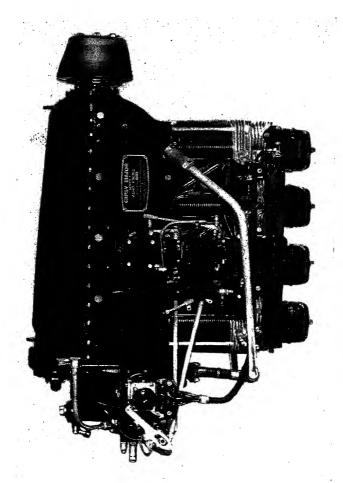
$Model\ldots\ldots$	R-1340 S1H1-G.		
Type	9 cylinders, 1-row radial, air coole 4-cycle.	ed, geared drive, supercharged,	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.67:1.		
Supercharger	SuperchargerGear-driven 1-speed supercharger, ratio 10.0:1.		
Carburation	.1 Bendix-Stromberg NA-Y9H u matic mixture control.	updraft carburetor with auto-	
Ignition			
Lubrication	Pressure feed, 70-90 lb./sq.in. (4	1,9 - 6,3 kg/cm ²). Dry sump.	
Starter	Optional. Eclipse Series 43 inert starter can be used.	ia and direct cranking electric	
Compression ratio Diameter Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)	5.75 in. 1,344 cu.in. 6.0:1 51.4 in. 47.8 in. 14.4 sq.ft. 930 lb. 1.55 lb./h.p. (cr.) 0.48 lb./h.p./hr. cr.) 0.015 lb./h.p./hr. 91/96 grade y) 100-120 S.U. secs. nt 0.45 h.p./cu.in. 2.56 h.p./sq.in. 157 lb./sq.in.	146 mm 146 mm 22.0 lit 6,0:1 1 305 mm 1 214 mm 1,34 m² 422 kg 0,70 kg/hp 220 g/hp/hr 7 g/hp/hr 91/96 grade 20,5 - 25,1 cs 27,2 hp/lit 0,40 hp/cm² 10,9 m/sec 11,0 kg/cm²	
Rating (normal) .		0 ft. (1 500 m)	



Commonwealth Aircraft Pratt & Whitney Twin Wasp R-1830

Model		
Type	r cooled, geared drive, super-	
Construction 3-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Planetary reduction gear, ratio 0.56:1.		
SuperchargerGear-driven 1-speed supercharge	er, ratio 7.15:1.	
Carburation 1 Bendix-Stromberg PD-12B8 or PD-12H1 2-barrel injection type downdraft carburetor with automatic mixture control.		
Ignition2 Bendix-Scintilla SF14LN-3 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.		
Lubrication Pressure feed, 75-100 lb./sq.in.	(5,3 - 7,0 kg/cm ²). Dry sump.	
Starter Optional. Eclipse Series 43 iner starter can be used.	tia and direct cranking electric	
Bore	140 mm 140 mm 30,0 lit 6,7:1 1 221 mm 1 593 mm 1,17 m ² 662 kg 0,55 kg/hp 215 g/hp/hr 7 g/hp/hr 91/96 grade 20,5 - 25,1 cs 40,0 hp/lit 0.56 hp/cm ² 12,6 m/sec 13,5 kg/cm ²	
Rating (take-off)1,200 h.p./2,700 r.p.m./48.0 in. (1 219 mm) Hg. boost Rating (military)1,200 h.p./2,700 r.p.m./3,700 ft. (1 100 m) Rating (normal)1,100 h.p./2,550 r.p.m./7,500 ft. (2 300 m) Rating (max. cruising)700 h.p./2,250 r.p.m./17,000 ft. (5 200 m)		

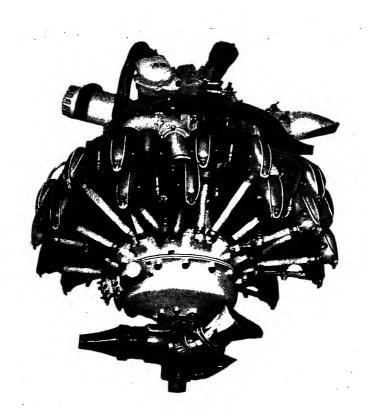




General Motors-Holdens De Havilland Gipsy Major

Model Gipsy Major I.			
Type			
and detachable aluminum-bron exhaust valve per cylinder ac	2-piece magnesium alloy crankcase. Cylinders with steel barrels and detachable aluminum-bronze heads, 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings. Equipped for fixed pitch propeller.		
Supercharger None.	None.		
Carburation 1 Hobson A148 downdraft carburetor with automatic mixture control.			
Ignition 2 B.T.H. AG4-4 or Bendix-Scintilla SB-4 magnetos. 2 12-mm short reach spark plugs per cylinder.			
Lubrication Pressure feed, 40-45 lb./sq.in. (2,8-3,2 kg/cm ²). Dry sump.			
StarterNone.			
Bore	118 mm 140 mm 6,1 lit 5,25:1 508 mm 752 mm 1 212 mm 0,35 m² 143 kg 1,08 kg/hp 220 g/hp/hr 9 g/hp/hr 73 octane 20,5 cs 21,3 hp/lit 0,30 hp/cm² 11,0 m/sec 8,3 kg/cm²		
Rating (take-off)	level level		

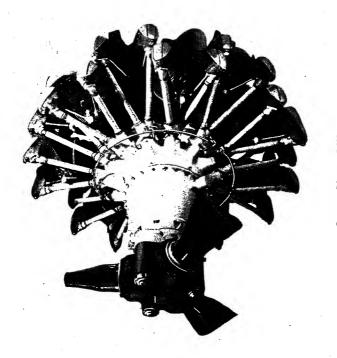
This engine is known as the Gipsy Trainer when used in Royal Australian Air Force aircraft.



Gnome-Rhone 14M

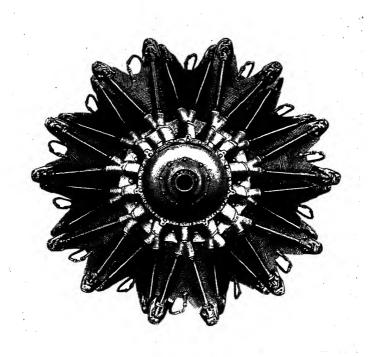
Model	. 14M-8.		
Type	.14 cylinders, 2-row radial, air charged, 4-cycle.	cooled, geared drive, super-	
Construction	Construction1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.71:1.		
Supercharger	.Gear-driven 1-speed supercharge	er.	
Carburation	.1 Bronzavia updraft carburetor and altitude control.	with automatic boost control	
Ignition 2 R.B. magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.	
Starter	Air Equipment electric inertia	starter.	
Compression ratio Diameter Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (mas Piston speed (mas		122 mm 116 mm 19,0 lit 6,5:1 950 mm 1 251 mm 0,70 m² 419 kg 0,56 kg/hp 220 g/hp/hr 8 g/hp/hr 87 octane 25,1 cs 39,5 hp/lit 0,46 hp/cm² 11,7 m/sec 10,6 kg/cm²	
Rating (take-off)			
14M-00, 14M-01:	615 h.p./3,000 r.p.m./take-off; (4 900 m) military rating. Gear 87-octane gasoline.		
14M-6, 14M-7:	700 h.p./3,030 r.p.m./take-off; (4 000 m) military rating. Redusupercharger. 87-octane gasoling	ction gear ratio 0.71:1. 1-speed	
14M-9:	Same as 14M-8. Propeller rota	tes in opposite direction.	





Gnome-Rhone 14N

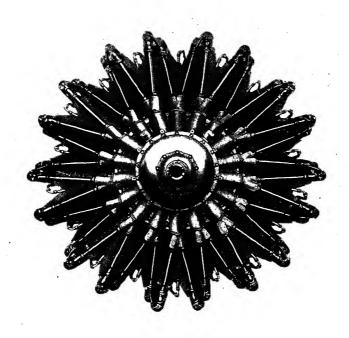
Model	. 14N-48.		
Туре	.14 cylinders, 2-row radial, air charged, 4-cycle.	cooled, geared drive, super-	
Construction	ion		
Supercharger	Gear-driven 1-speed supercharge	r.	
Carburation	.1 Bronzavia updraft carburetor with automatic boost control and altitude control.		
Ignition	2 R.B. magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.	
Starter	Air Equipment electric inertia	starter.	
Compression ratio Diameter Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption (of Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max		146 mm 165 mm 38,7 lit 6,8:1 1 290 mm 1 480 mm 1,30 m² 750 kg 0,64 kg/hp 220 g/hp/hr 8 g/hp/hr 87 octane 25,1 cs 30,5 hp/lit 0,50 hp/cm² 13,2 m/sec 11,6 kg/cm²	
Rating (take-off)1,180 h.p./2,400 r.p.m./38.6 in. (980 mm) Hg. boost Rating (military)1.060 h.p./2,400 r.p.m./12.800 ft. (3 900 m) Rating (cruising)850 h.p./2,100 r.p.m./12,800 ft. (3 900 m)			
14N-44, 14N-45:	14N-44, 14N-45: 1,050 h.p./2,400 r.p.m./take-off; 980 h.p./2,400 r.p.m./5,700 ft. (1 700 m) military rating. Reduction gear ratio 0.50:1. 1-speed supercharger. 87-octane gasoline.		
14N-49:	Same as 14N-48. Propeller rotate	es in opposite direction.	
14N-50:	1,400 h.p./2,400 r.p.m./take-off; (1 700·m) and 1,200 h.p./2,40 military rating. Reduction gea charger, 92-octane gasoline.	00 r.p.m./13.100 ft. (4 000 m)	



Gnome-Rhone 14R

Gnome-Rhone 14R

$Model\ldots\ldots\ldots$.14R-4.	
Туре	.14 cylinders, 2-row radial, air charged, 4-cycle.	cooled, geared drive, super-
Construction	1-piece barrel type aluminum al steel barrels and aluminum all exhaust valve (sodium cooled) rods. 2-throw 3-piece counterbal 3 roller bearings. Planetary or ratio 0.67:1.	oy heads. 1 inlet valve and 1 per cylinder actuated by push anced crankshaft supported in
Supercharger	.Gear-driven 2-speed supercharger	r, ratios 6.5:1 and 9.0:1.
Carburation	.1 Bronzavia updraft carburetor and altitude control.	with automatic boost control
Ignition	2 R.B. magnetos, 2 18 mm short Shielded ignition system.	reach spark plugs per cylinder.
Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.
Starter	Air Equipment electric inertia st	tarter.
Fuel consumption (Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		146 mm 165 mm 38.7 lit 6,8:1 1 297 mm 1 635 mm 1,33 m ² 819 kg 0,49 kg/hp 220 g/hp/hr 5 g/hp/hr 92 octane 25,1 cs 42,9 hp/lit 0,71 hp/cm ² 14,3 m/sec 15,0 kg/cm ²
Rating (military, l Rating (military, l Rating (normal, lo		300 ft. (1 000 m) 3,000 ft. (5 500 m) 900 ft. (2 100 m)
Note: 100-octane g	asoline is used for take-off.	
14R-5:	Same as 14R-4. Propeller rotate	s in opposite direction.



Gnome-Rhone 18R

FRANCE

Gnome-Rhone 18R

Model	18R-1.	,	
Type	.18 cylinders, 2-row radial, air charged, 4-cycle.	r cooled, geared drive, super-	
Construction	1-piece barrel type aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear.		
Supercharger	.Gear-driven 2-speed supercharge	er.	
Carburation 1 Bronzavia updraft carburetor with automatic boost control and altitude control.			
Ignition 2 R.B. magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication	.Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.	
Starter	.Air Equipment electric inertia s	starter.	
Compression ratio Diameter Length Frontal area Weight Weight/horsepowe: Fuel consumption Oil consumption Oil consumption Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max.)		146 mm 165 mm 49,7 lit 6,8:1 1 290 mm 1 630 mm 1,30 m ² 966 kg 0,42 kg/hp 210 g/hp/hr 5 g/hp/hr 92 octane 25,1 cs 46,3 hp/lit 0,76 hp/cm ² 14,3 m/sec 16,2 kg/cm ²	
Rating (military, Rating (military, Rating (normal, 1		3,300 ft. (1 000 m) 2,300 ft. (6 800 m) 3,900 ft. (2 100 m)	

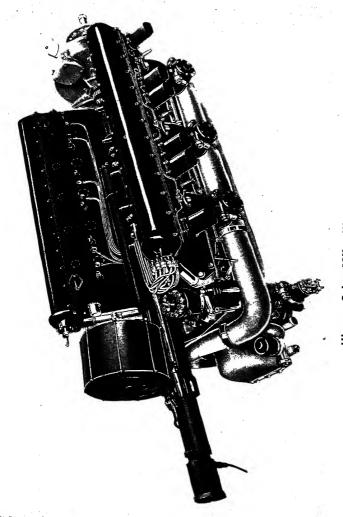
Note: 100-octane gasoline is used for take-off.



Hispano-Suiza 12Y

Model	.12Y-50.	
Type	.12 cylinders, vee 60 degrees, drive, supercharged, 4-cycle.	ethylene glycol cooled, geared
Construction	2-piece aluminum alloy crankca blocks with integral heads. Stee and 1 exhaust valve (sodium co overhead camshaft. 6-throw 1-pi plain bearings. Spur reduction peller shaft for cannon.	el cylinder liners. 1 inlet valve oled) per cylinder actuated by iece crankshaft supported in 7
Supercharger	. Gear-driven 1-speed supercharge	r, ratio 10.0:1.
Carburation	.6 Hispano-Solex 56S2 updraft ca sure regulators for altitude cont	
Ignition	.2 Voltex R.B. P12A magnetos, plugs per cylinder. Shielded ign	. 2 18-mm short reach spark ition system.
Lubrication	Pressure feed, 85 lb./sq.in. (6,0	kg/cm ²). Dry sump.
Starter	Air Equipment compressed gas st	arting system.
Fuel consumption (Oil consumption (Gasoline grade Oil grade (viscosit: Output/displacemei Output/piston area Piston speed (max B.m.e.p. (max.)		150 mm 170 mm 36,0 lit 7,0:1 764 mm 945 mm 2 137 mm 0,49 m² 492 kg 0,45 kg/hp 225 g/hp/hr 8 g/hp/hr 87 octane 20,5 cs 30,5 hp/lit 0,52 hp/cm² 14,2 m/sec 11,1 kg/cm²
Rating (military)		0.800 ft. (3 300 m)
12Y-30, 12Y-31:	830 h.p./2,400 r.p.m./take-off; 8 (3 300 m) military rating. Redu supercharger, ratio 10.0:1. 87-oct shaft for cannon.	iction gear ratio 0.67:1. 1-speed
12Y-32, 12Y-33:	960 h.p./2,400 r.p.m./take-off; (2 300 m) military rating. Redusupercharger, ratio 10.0:1. 87-oc	ection gear ratio 0.67:1. 1-speed
12Y-36, 12Y-37:	1,050 h.p./2,400 r.p.m./take-off; (2 300 m) military rating. Redusupercharger, ratio 8.3:1. 87-octa	iction gear ratio 0.55:1. 1-speed
12 Y- 51:	Same as 12Y-50. Propeller rotates	s in opposite direction.



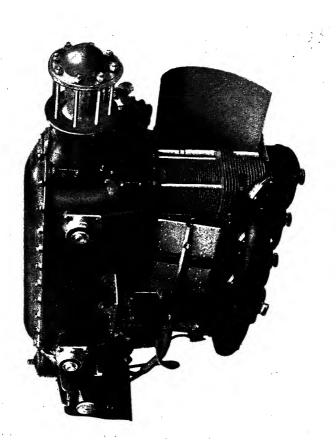


Hispano-Suiza 12Z

Model			
Type	rs, vee 60 degrees, crcharged, 4-cycle.	ethylene glycol cooled, geared	
blocks with and 2 exha overhead c plain beari	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.44:1. Hollow pro- peller shaft for cannon.		
Supercharger Gear-driven	Gear-driven 1-speed supercharger, ratio 10.0:1.		
Carburation			
Ignition 2 R.B. magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication Pressure fe	ed, 85 lb./sq.in. (6,0	kg/cm ²). Dry sump.	
Starter Compressed	l gas starting system.	•	
Bore	in. 7 cu.in. 1 in. in. in. sq.ft. 8 lb. lb./h.p. lb./h.p./hr. 8 lb./h.p./hr. cutane S.U. secs. h.p./cu.in. h.p./sq.in. 2 ft./min. lb./sq.in.	150 mm 170 mm 36,0 lit 77,0:1 770 mm 945 mm 2 150 mm 0,50 m² 575 kg 0,44 kg/hp 220 g/hp/hr 8 g/hp/hr 92 octane 20,5 cs 36,1 hp/lit 0,61 hp/cm² 15,9 m/sec 11,7 kg/cm²	
Rating (take-off) 1,300 Rating (military) 1,20 Rating (cruising) 1,00	0 h.p./2,800 r.p.m./13	3,100 ft. (4 000 m) 3,100 ft. (4 000 m)	

This engine has a modified intake manifold with carburetors in the vee between the cylinder blocks. It is adaptable to direct fuel injection. It develops 1,500 h.p./2,800 r.p.m. at take-off with 100-octane gasoline.

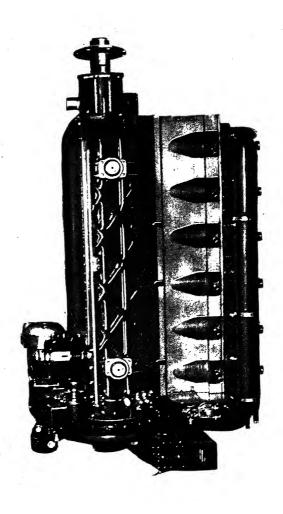




FRANCE 243

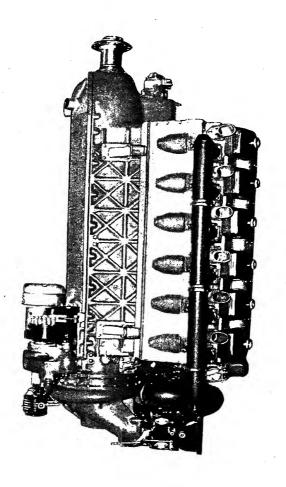
Renault 4P Bengali

Model	.4P-ei.	
Туре	.4 cylinders, inverted in-line, air cooled, direct drive, not super-charged, 4-cycle.	
Construction	struction1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. I inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.	
Supercharger	. None.	
Carburation	.1 Zenith downdraft carburetor.	
Ignition2 Scintilla magnetos. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication Pressure feed, 45 lb./sq.in. (3,0 kg/cm ²). Dry sump.		
Starter Air Equipment electric starter.		
Fuel consumption (Oil consumption (Oasoline grade Oil grade (viscosi Output/displaceme Output/piston are Piston speed (ma B.m.e.p. (max.)		120 mm 140 mm 6.3 lit 5.7:1 480 mm 780 mm 1 279 mm 0.33 m ² 147 kg 0.98 kg/hp 260 g/hp/hr 10 g/hp/hr 10 g/hp/hr 80 octane 20,5 - 25,1 cs 23.8 hp/lit 0.31 hp/cm ² 11,7 m/sec 8,7 kg/cm ²
Rating (take-off)150 h.p./2,500 r.p.m. Rating (normal)140 h.p./2,400 r.p.m./sea level Rating (cruising)120 h.p./2,200 r.p.m./sea level		
4P-gi:	105 h.p./1,900 r.p.m./take-off; normal rating. Direct drive. No line.	



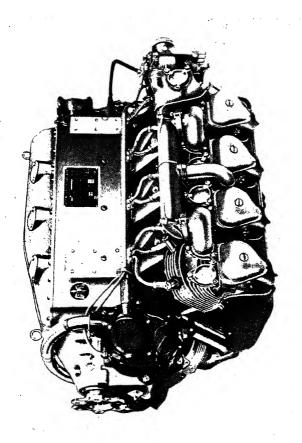
Renault 6Q

Model			
Type			
Construction 1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings.			
Supercharger	Supercharger Gear-driven 1-speed supercharger, ratio 12.3:1.		
Carburation	.1 Zenith updraft carburetor with	h automatic boost control.	
Ignition			
Lubrication Pressure feed, 45 lb./sq.in. (3,0 kg/cm ²). Dry sump.			
Starter	Air Equipment electric starter.		
Fuel consumption of Coll consumption (Coll consumption (Coll consumption (Coll consumption)) of Coll consumption (Coll consumption) of		120 mm 140 mm 9,5 lit 6,4:1 523 mm 931 mm 1 625 mm 0,44 m ² 256 kg 1.07 kg/hp 250 g/hp/hr 10 g/hp/hr 87 octane 20,5 - 25,1 cs 25,3 hp/lit 0,35 hp/cm ² 11,7 m/sec 9,1 kg/cm ²	
Rating (take-off)			
6Q-02, 6Q-03:	240 h.p./2,500 r.p.m./take-off; 220 h.p./2,500 r.p.m./6,200 ft. (1 900 m) normal rating. Direct drive. 1-speed supercharger, ratio 7.6:1. 87-octane gasoline.		
6Q-05:	Same as 6Q-04. Propeller rotate	s in opposite direction.	
6Q-08, 6Q-09:	240 h.p./2,500 r.p.m./take-off and normal rating at sea level. Direct drive. Not supercharged, 87-octane gasoline.		



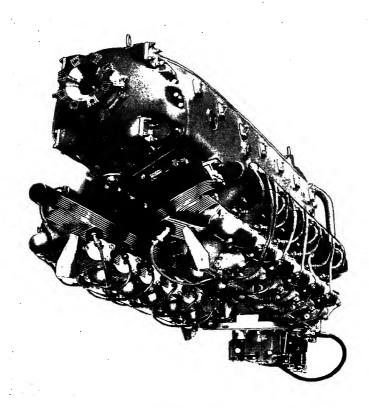
Renault 12R

Model		
Type	.12 cylinders, inverted vee 60 degrees, air cooled, direct drive, supercharged, 4-cycle.	
with steel barrels and detact inlet valve and 1 exhaust valv	struction	
SuperchargerGear-driven 1-speed supercharger, ratio 11.7:1.		
Carburation1 Bronzavia updraft carburete	or with automatic boost control.	
Ignition 2 S.E.V. magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication Pressure feed, 60 lb./sq.in. (4,0 kg/cm ²). Dry sump.		
StarterAir Equipment electric starter	г.	
Bore	120 mm 140 mm 19.0 lit 6.4:1 680 mm 929 mm 2 072 mm 0.45 m² 439 kg 0.88 kg/hp 225 g/hp/hr 10 g/hp/hr 87 octane 20,5-25,1 cs 26,3 hp/lit 0.36 hp/cm² 11,7 m/sec 9,6 kg/cm²	
Rating (take-off)500 h.p./2,500 r.p.m. Rating (military)450 h.p./2,500 r.p.m./13,100 ft. (4 000 m) Rating (cruising)300 h.p./2,100 r.p.m./13,100 ft. (4 000 m)		
12R-01: Same as 12R-00. Propeller rot	ates in opposite direction.	



Argus As 10

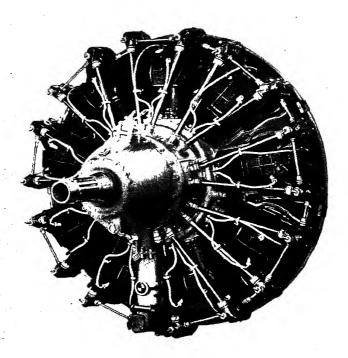
Model	As 10-C3.		
Type			
Construction	Construction1-piece elektron crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece counterbalanced crankshaft supported in 5 plain bearings.		
Supercharger	None.		
Carburation 1 Sum 729 carburetor and 1 Sum 730 carburetor with mixture control.			
Ignition 2 Bosch GE3-B magnetos. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication Pressure feed, 45-85 lb./sq.in. (3,0-6,0 kg/cm ²). Dry sump.			
Starter	Bosch electric starter.		
Fuel consumption (Oil consumption (Oasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (mar B.m.e.p. (max.)		129 mm 140 mm 12,7 lit 5,9:1 718 mm 880 mm 1 105 mm 0,38 m ² 213 kg 0,81 kg/hp 235 g/hp/hr 9 g/hp/hr 80,5-25,1 cs 18,9 hp/lit 0,27 hp/cm ² 9,3 m/sec 8,6 kg/cm ²	
Rating (take-off)			
As 10-E:	line.	t supercharged. 80-octane gaso-	
As 401:		270 h.p./2,050 r.p.m./9,800 ft. action gear ratio 0.67:1. 1-speed ee.	



Argus As 410

Argus As 410

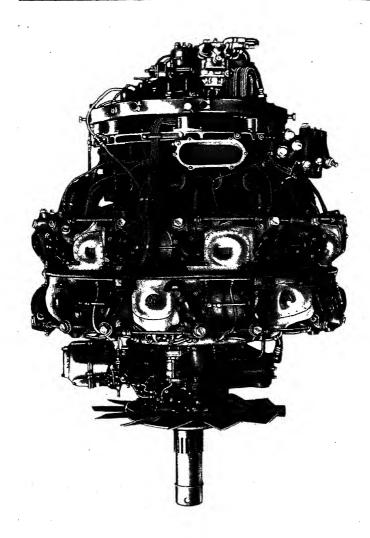
Model	As 410-A1.		
Type	Type		
Construction	Construction1-piece elektron crankcase with cover plate. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Planetary reduction gear, ratio 0.67:1.		
Supercharger	SuperchargerGear-driven 1-speed supercharger, ratio 8.73:1.		
Carburation 1 Argus-Hobson updraft carburetor with automatic mixture control and altitude control.			
Ignition			
Lubrication	Pressure feed, 45-85 lb./sq.in. (3,0 - 6,0 kg/cm ²). Dry sump.	
Starter	Bosch electric starter.		
Fuel consumption (Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (mas B.m.e.p. (max.)		105 mm 115 mm 12,0 lit 6,4:1 660 mm 860 mm 1 570 mm 0,36 m ² 315 kg 0,70 kg/hp 200 g/hp/hr 7 g/hp/hr 87 g/hp/hr 820,5 - 25,1 cs 37,5 hp/lit 0,43 hp/cm ² 12,3 m/sec 10,7 kg/cm ²	
Rating (take-off)			
As 411:	500 h.p./3,400 r.p.m./take-off; (4 000 m) military rating. Redusupercharger. 92-octane gasoline	action gear ratio 0.67:1. 1-speed	



B.M.W. 132

B.M.W. 132

	J	
Model	. 132-K.	
Type 9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.		
Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Double planetary reduction gear, ratio 0.72:1.		
Supercharger	Gear-driven 1-speed supercharger, ratio 7.02:1. Automatic boost pressure regulator.	
Injection	Direct fuel injection. 1 Bosch automatic altitude control and injector per cylinder.	9-plunger injection pump with fuel de-aerator. 1 pintle-type
Ignition	.2 Bosch GE9-BLS magnetos. 2 per cylinder. Shielded ignition s	14-mm short reach spark plugs ystem.
Lubrication	Pressure feed, 70-85 lb./sq.in. (5	5,0-6,0 kg/cm ²). Dry sump.
Starter	Bosch electric inertia starter.	
Fuel consumption (Oil consumption (Gasoline grade Oil grade (viscosity Output/displacemer Output/piston area Piston speed (max. B.m.e.p. (max.) Rating (take-off) Rating (normal)		156 mm 162 mm 27,7 lit 6,9:1 1 380 mm 1 217 mm 1 217 mm 1,49 m² 530 kg 0,53 kg/hp 205 g/hp/hr 8 g/hp/hr 87 octane 20,5 - 25,1 cs 36,1 hp/lit 0,58 hp/cm² 13,5 m/sec 13,1 kg/cm² 0 ft. (3 000 m)
132-F:	800 h.p./2,250 r.p.m./take-off; 8 (4 300 m) normal rating. Geare Direct fuel injection. 87-octane	300 h.p./2,230 r.p.m./14,100 ft. ed drive. 1 speed supercharger.
132-H:	1.000 h.p./2,350 r.p.m./take-off; 880 h.p./2,350 r.p.m./8,200 ft. (2 500 m) normal rating, Reduction gear ratio 0.62:1. 1-speed supercharger, ratio 7.87:1. Pallas NA-Y9A updraft carburetor. 87-octane gasoline.	
132-L:	800 h.p./2,250 r.p.m./take-off; (1 000 m) normal rating. Direratio 7.87:1. Pallas NA-Y9A gasoline.	ct drive. 1-speed supercharger, updraft carburetor. 87-octane
132-N:	865 h.p./2,300 r.p.m./take-off; 8 (4 500 m) normal rating. Reduce supercharger, ratio 10.14:1. Digasoline.	ction gear ratio 0.62:1. 1-speed

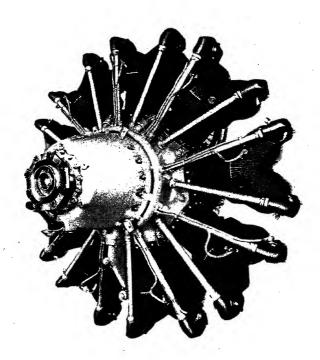


B.M.W. 801

Model801-D1.		
	Type	
	3-piece steel crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 4-piece counterbalanced crankshaft supported in 2 roller bearings and 1 large central ball bearing. Planetary spur reduction gear, ratio 0.54:1. 12-blade fan 31.5 in. (800 mm) in diameter for cooling, geared 1.72 times crankshaft speed or 3.2 times propeller speed.	
	Gear-driven 2-speed supercharg Askania variable datum automa	
•	Direct fuel injection, 1 Deckel 14-plunger injection pump with automatic altitude control. Fuel de-aerator, 1 swirl-pintle type injector per cylinder.	
Ignition	. 1 Bosch ZM14-CR10 or ZM14-DR13 dual magneto. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 115-130 lb./sq.in.	(8,0 - 9,0 kg/cm ²). Dry sump.
Starter	Bosch electric inertia starter.	
Oil consumption (c Gasoline grade Oil grade (viscosity Output/displacemen Output/piston area Piston speed (max.) B.m.e.p. (max.)		156 mm 156 mm 41,8 lit 6,5:1 1 320 mm 1 500 mm 1,37 m² 880 kg 0,52 kg/hp 205 g/hp/hr 8 g/hp/hr 92 octane 20,5 cs 40,6 hp/lit 0,62 hp/cm² 14,0 m/sec 13,8 kg/cm²
Rating (take-off)		
This engine has a maximum output of 1,700 h.p. at 23.000 ft. (7 000 m) when equipped with a 3-speed supercharger.		
801-A1:	1.580 h.p./2,700 r.p.m./take-off; ft. (4 800 m) and 1,460 h.p./2, military rating. Reduction gea charger, ratios 5.07:1 and 7.46: rotates clockwise.	400 r.p.m./16,400 ft. (5 000 m) or ratio 0.54:1. 2-speed super-
801-B:	Same as 801-A. Propeller rotate	s counter-clockwise.

Same as 801-A. Propeller rotates clockwise. No oil cooler.

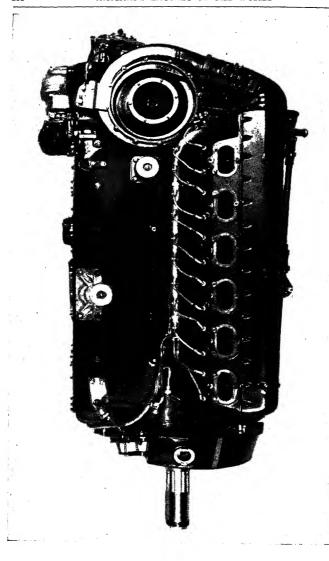
801-C:



Bramo Fafnir 323

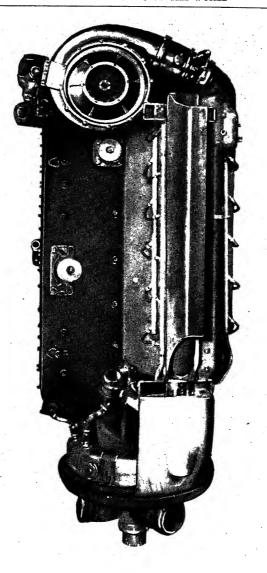
Bramo Fafnir 323

Model	Fafnir 323-P1.	
Туре	Type 9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.	
Construction	2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. I inlet valve and I exhaust valve (sodium cooled) per cylinder actuated by push rods. I-throw 2-piece counterbalanced crankshaft supported in 2 roller hearings. Epicyclic hevel reduction gear, ratio 0.62:1. Equipped for V.D.M. electric-type propeller.	
Supercharger	. Gear-driven 2-speed superchar Askania variable datum boost c	ger, ratios 9.6:1 and 12.4:1.
Injection	Direct fuel injection. 1 Bosch automatic mixture control. Fue 60M-6 pintle type injector per control.	el de-aerator. 1 Bosch DE40N-
Ignition	mition	
Lubrication	Pressure feed, 85-100 lb./sq.in.	(6,0-7,0 kg/cm ²). Dry sump.
Starter	Bosch electric inertia starter.	
Bore 6.06 in. 154 mm Stroke 6.30 in. 160 mm Displacement 1,636 cu.in. 26,8 lit Compression ratio 6.23:1 5,23:1 Diameter 55.5 in. 1 410 mm Length 67.5 in. 1,715 mm Frontal area 16.8 sq.ft. 1,56 m² Weight 1,320 lb. 599 kg Weight/horsepower 1.34 lb./h.p. 0,61 kg/hp Fuel consumption (cr.) 0.45 lb./h.p./hr. 6 g/hp/hr Oil consumption (cr.) 0.013 lb./h.p./hr. 6 g/hp/hr Gasoline grade 87 octane 87 octane Oil grade (viscosity) 100-120 S.U. secs. 20,5 -25,1 cs Output/displacement 0.60 h.p./cu.in. 36,7 hp/lit Output/piston area 3.79 h.p/sq.in. 0.59 hp/cm² Piston speed (max.) 2,625 ft./min. 13,3 m/sec B.m.e.p. (max.) 190 lb./sq.in. 13,3 kg/cm²		
Rating (take-off)985 h.p./2,500 r.p.m./44.9 in. (1 141 mm) Hg. boost Rating (military, low) 810 h.p./2,500 r.p.m./8,500 ft. (2 600 m) Rating (military, high) 775 h.p./2,500 r.p.m./13,900 ft. (4 200 m) Rating (normal, low)670 h.p./2,100 r.p.m./8,500 ft. (2 600 m) Rating (normal, high)625 h.p./2,100 r.p.m./16,400 ft. (5 000 m) Rating (cruising)550 h.p./2,000 r.p.m./13,900 ft. (4 200 m)		
Fafnir 323-J:	(4 200 m) military rating. Redu	830 h.p./2,350 r.p.m./13,800 ft. action gear ratio 0.62:1. 1-speed irect fuel injection. 87-octane
Fafnir 323-M:	(2 000 m) military rating. Red	; 840 h.p./2,350 r.p.m./6,500 ft. uction gear ratio 0.62:1. 1-speed rect fuel injection. 87-octane



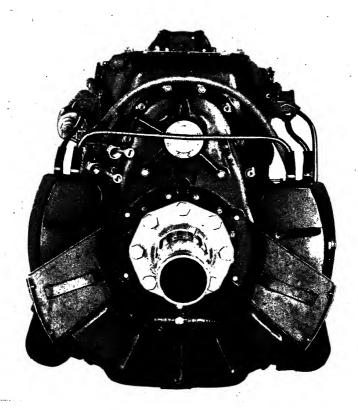
Daimler-Benz DB 601

Model	DB 601-E.	
• •	.12 cylinders, inverted vee 60 degeared drive, supercharged, 4-c	ycle.
Construction	.1-piece silumin-gamma crankcase with cover plate. 2 cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Roller bearings in connecting rod big-ends. Spur reduction gear, ratio 0.53:1. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven variable speed 1-stage supercharger, ratio 7.0:1 to 10.08:1. Hydraulic coupling to impeller with degree of slip regulated by automatic altitude control. Impeller 10.2 in. (260 mm) in diameter.	
	Direct fuel injection. 1 Bosch PZ12HM100-11 12-plunger injection pump with automatic altitude control. Fuel de-aerator. 1 Bosch closed type 4-orifice injector per cylinder.	
Ignition	1 Bosch ZM12-BR4 dual magnet plugs per cylinder. Shielded ign	to. 2 14-mm short reach spark nition system.
Lubrication	Pressure feed, 70 lb./sq.in. (5,0 l	kg/cm ²). Dry sump.
Starter	Bosch electric inertia starter.	
Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption Oil grade (viscosit Output/displaceme Output//piston area Piston speed (max.)		150 mm 160 mm 160 mm 133,9 lit 7,2:1 712 mm 1 000 mm 1 720 mm 0,50 m ² 715 kg 0,52 kg/hp 200 g/hp/hr 5 g/hp/hr 92 octane 20,5 - 25,1 cs 40,6 hp/lit 0,71 hp/cm ² 14,4 m/sec 13,6 kg/cm ²
Rating (take-off) 1,375 h.p./2,700 r.p.m./41.2 in. (1 046 mm) Hg. boost Rating (military) 1,375 h.p./2,700 r.p.m./18,000 ft. (5 500 m) Rating (max. cruising) 1,000 h.p./2,200 r.p.m./18,000 ft. (5 500 m)		
DB 601-A:	1.200 h.p./2,400 r.p.m./take-off; ft. (4 100 m) military rating. Variable speed 1-stage superch Direct fuel injection. 92-octane g	. Reduction gear ratio 0.53:1. narger, ratio 7.0:1 to 10.38:1. gasoline.
DB 601-F1:	1,395 h.p./2,600 r.p.m./take-off; ft. (6 000 m) military rating. Variable speed 1-stage superch Direct fuel injection. 92-octane	. Reduction gear ratio 0.53:1. narger, ratio 7.0:1 to 10.08:1. gasoline.
DB 601-N:	Similar to DB 601-A. 1,200 h. h.p./2,600 r.p.m./16,400 ft. (5	.p./2,600 r.p.m./take-off; 1,270 000 m) military rating.



Daimler-Benz DB 603

Model	DB 603-A.	
Type	.12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	1-piece silumin-gamma crankcase with cover plate. 2 cylinder blocks with detachable heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 double-row roller bearings. Spur reduction gear, ratio 0.474:1 or 0.518:1.	
Supercharger	Gear-driven variable speed 1-stage supercharger, ratio 9.22:1. Hydraulic coupling to impeller with degree of slip regulated by automatic altitude control.	
InjectionDirect fuel injection. 1 Bosch PZ12HP120.33 12-plunger injection pump with automatic altitude control. Fuel de-aerator. 1 Bosch injector per cylinder.		
Ignition		
Lubrication	Pressure feed, 60 lb./sq.in. (4,2	kg/cm ²). Dry sump.
Starter	Bosch electric inertia starter.	
Compression ratio Width Height Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption Oil consumption (c Gasoline grade (viscosit Output/displaceme Output/piston area Piston speed (max. B.m.e.p. (max.)		162 mm 180 mm 44,5 lit 7,0:1 815 mm 1 140 mm 2 565 mm 0,65 m ² 962 kg 0,53 kg/hp 200 g/hp/hr 5 g/hp/hr 92 octane 20,5 - 25,1 cs 40,5 hp/lit 0,72 hp/cm ² 16,2 m/sec 13,6 kg/cm ²
Rating (military)		3,000 ft. (5 500 m)



Daimler-Benz DB 605

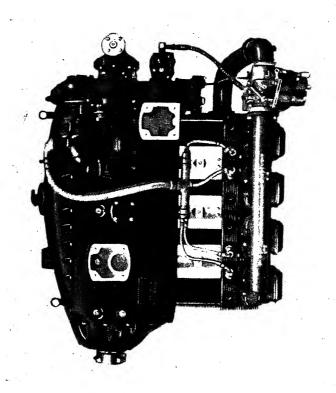
Daimler-Benz DB 605

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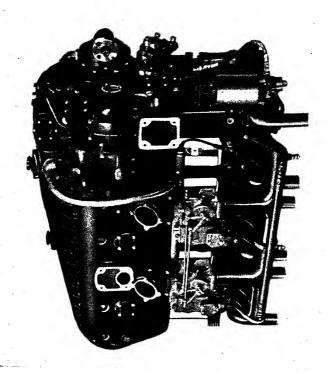
Model	DB 605-A1.	
Type	.12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	n1-piece silumin-gamma crankcase with cover plate. 2 cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crank- shaft supported in 7 plain bearings. Plain bearings in connect- ing rod big-ends. Spur reduction gear. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven variable speed 1-stage supercharger, ratio 7.0:1 to 10.08:1. Hydraulic coupling to impeller with degree of slip regulated by automatic altitude control. Impeller 10.5 in. (266 mm) in diameter.	
Injection	Direct fuel injection. I Bosch PZ12HM112-25 12-plunger injection pump with automatic mixture control, Fuel de-aerator, I closed-type 6-orifice injector per cylinder.	
Ignition	1 Bosch ZM12-BR4 dual magne plugs per cylinder. Shielded ign	eto. 2 14-mm short reach spark nition system.
Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.
Starter	Bosch electric inertia starter.	
Compression ratio Width Height Length Frontal area Weight Weight/horsepowe Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		154 mm 160 mm 35,7 lit 7,2:1 720 mm 1 010 mm 1 740 mm 0,51 m ² 745 kg 0,49 kg/hp 200 g/hp/hr 5 g/hp/hr 9 g/thp/hr 9 g/thp/lr 20,5 - 25,1 cs 42,0 hp/lit 0,67 hp/cm ² 14,4 m/sec 14,2 kg/cm ²
Rating (military)	1,500 h.p./2,700 r.p.m. 1,350 h.p./2,600 r.p.m./19 sing) 1,000 h.p./2,100 r.p.m./19	9,700 ft. (6 000 m) 9,700 ft. (6 000 m)
DB 605-B1:	Same as DR 605-A1 but has a	different reduction gear ratio

DB 605-B1: Same as DB 605-A1, but has a different reduction gear ratio.

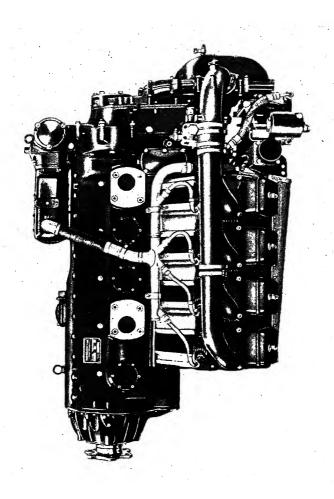
Note: These engines are similar to the Daimler-Benz DB 601-E in general design, but they have modified cylinder blocks and reduction gear, plain bearings in connecting rod big-ends and improved valve gear giving better cylinder scavenging.



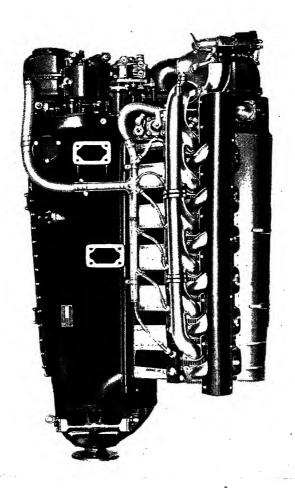
Model	HM 504-A2.	
Туре	pe4 cylinders, inverted in-line, air cooled, direct drive, not super- charged, 4-cycle.	
Construction	1-piece elektron crankcase. Cover serves as oil tank. Cylinders with cast-iron barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw built-up crankshaft supported in 5 roller bearings.	
Supercharger	. None.	
Carburation	1 Pallas 40VAH carburetor wit	h automatic mixture control.
Ignition		
Lubrication	Pressure feed, 45 lb./sq.in. (3,0	kg/cm ²). Dry sump.
Starter	Bosch hand starter.	
Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		105 mm 115 mm 4,0 lit 6,0:1 505 mm 727 mm 938 mm 0,33 m² 112 kg 1,07 kg/hp 220 g/hp/hr 1,5 g/hp/hr 80 octane 20,5 - 25,1 cs 26,2 hp/lit 0,30 hp/cm² 9,7 m/sec 9,6 kg/cm²
Rating (normal)	105 h.p./2.530 r.p.m. 95 h.p./2,450 r.p.m./sea 75 h.p./2,260 r.p.m./sea	level level



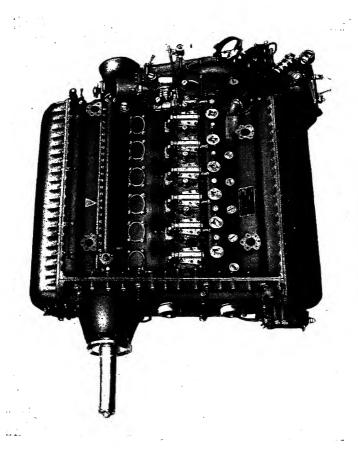
Model	HM 506-A1.		
Туре	.6 cylinders, inverted in-line, air charged, 4-cycle.	cooled, direct drive, not super-	
Construction	.1-piece elektron crankcase. Cover serves as oil tank. Cylinders with cast-iron barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw built-up crankshaft supported in 7 roller bearings.		
Supercharger	. None.		
Carburation	Carburation 2 Sum 713-1 downdraft carburetors with automatic mixture control.		
Ignition 1 Bosch JF6-ARS48 magneto and 1 Bosch JF6-ARS49 magneto. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication	Pressure feed, 45 lb./sq.in. (3,0	kg/cm ²). Dry sump.	
Starter	Bosch electric starter.		
Fuel consumption (Casoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		105 mm 115 mm 5,9 lit 6,0:1 735 mm 490 mm 1 276 mm 0,32 m ² 153 kg 0,96 kg/hp 225 g/hp/hr 3 g/hp/hr 80 octane 20,5 - 25,1 cs 27,1 hp/lit 0,31 hp/cm ² 9,6 m/sec 9,8 kg/cm ²	
Rating (normal) .		level level	



Model	.HM 508-D.	
Туре	e	
Construction	.1-piece elektron crankcase with cover plate. Cylinders with cast-iron barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw built-up crankshaft supported in 5 roller bearings. Planetary reduction gear, ratio 0.67:1.	
Supercharger	.Gear-driven 1-speed supercharge	er, ratio 4.5:1.
Carburation	1 Pallas 65VAH-2 updraft carburetor with automatic mixture control and boost control. Optional equipment: 1 Sum 698B1 updraft carburetor.	
Ignition	.1 Bosch ZJ-8 dual magneto. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.
Starter	Bosch electric starter.	
Fuel consumption oil consumption (of Gasoline grade Oil grade (viscosit; Output/displacemen Output/piston area Piston speed (max		105 mm 115 mm 8,0 lit 6,0:1 686 mm 820 mm 1 290 mm 0,40 m² 208 kg 0,74 kg/hp 215 g/hp/hr 3 g/hp/hr 80 octane 20,5 - 25,1 cs 35,0 hp/lit 0,40 hp/cm² 11,9 m/sec 10,4 kg/cm²
Rating (take-off)		
HM 508-C:	300 h.p./3,000 r.p.m./take-off; 285 h.p./3,000 r.p.m./8,200 ft. (2 500 m) normal rating. Reduction gear ratio 0.67:1. 1-speed supercharger. 80-octane gasoline.	
HM 508-H:	240 h.p./3,000 r.p.m./take-off; rating. Reduction gear ratio 0.6 gasoline.	

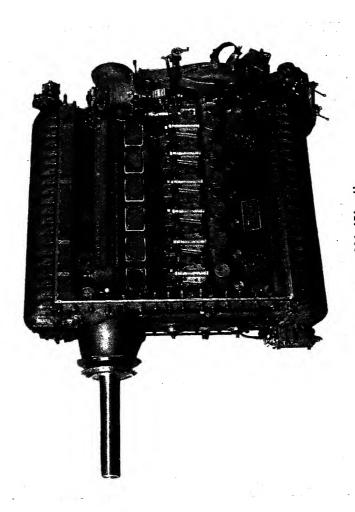


Model HM 512-B.		
Type		
iron barrels and detachable alum and 1 exhaust valve per cylinder built-up counterbalanced cranksh	l-piece elektron crankcase with cover plate. Cylinders with castiron barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods, 6-throw built-up counterbalanced crankshaft supported in 7 roller bearings, Planetary reduction gear, ratio 0.67:1.	
Supercharger Gear-driven 1-speed supercharger	r, ratio 9.3:1.	
Carburation 2 Pallas 65VAH-2 updraft carbu control and boost control.	aretors with automatic mixture	
	Ignition1 Bosch ZM12-BR1 dual magneto. 2 12-mm short reach spark plugs per cylinder. Shielded ignition system.	
Lubrication Pressure feed, 70 lb./sq.in. (5.0 l	kg/cm ²). Dry sump.	
Starter Bosch electric inertia starter.		
Bore	105 mm 115 mm 12,0 lit 6,0:1 657 mm 828 mm 1 507 mm 0,44 m² 275 kg 0,61 kg/hp 220 g/hp/hr 3 g/hp/hr 87 octane 20,5 cs 37,8 hp/lit 0,43 hp/cm² 11,9 m/sec 11,1 kg/cm²	
Rating (take-off)		
HM 512-A: 400 h.p./3,100 r.p.m./take-off; (500 m) normal rating. Reduct blower. 87-octane gasoline.		



Junkers Jumo 205 (Diesel)

Model	Jumo 205-Ea.	
Type	.6 (12) cylinders, in-line, water boosted, 2-cycle.	r cooled, geared drive, ground
Construction	. 1-piece silumin cylinder block with 2 elektron crankcase covers. 6 removable steel cylinder liners. 2 pistons in each cylinder with common combustion chamber. Piston-controlled inlet ports and exhaust ports around opposite ends of cylinders. 2 6-throw counterbalanced crankshafts supported in 7 plain bearings. Spur reduction gear, ratio 0.63:1. Hydraulic drive to propeller shaft.	
Supercharger	.Gear-driven 1-speed supercharge	r, ratio 8.9:1.
Injection	Direct fuel injection. 2 Junkers 4 Junkers open-type 2-orifice in pressure 8,500 lb./sq.in. (600 kg	njectors per cylinder. Injection
Ignition	. Compression.	
Lubrication	Pressure feed, 55-70 lb./sq.in.	(4,0-5,0 kg/cm ²). Dry sump.
Starter	Bosch electric inertia starter.	
Bore 4.13 in. 105 mm Stroke 2 x 6.30 in. 2 x 160 mm Displacement 1.014 cu.in. 16,6 lit Compression ratio 17.0:1 17,0:1 Width 23.6 in. 600 mm Height 52.2 in. 1 325 mm Length 80.0 in. 2 051 mm Frontal area 7.5 sq.ft. 0,70 m² Weight 1,257 lb. 570 kg Weight/horsepower 1.79 lb./hp. 0,81 kg/hp Fuel consumption (cr.) 0.035 lb./hp./hr. 160 g/hp/hr Oil consumption (cr.) 0.013 lb./h.p./hr. 6 g/hp/hr Fuel oil grade 50 to 60 cetane 50 to 60 cetane Lub. oil grade (viscosity). 100 S.U. secs. 20,5 cs Output/displacement 0.69 h.p./cu.in. 42,1 hp/lit Output/piston area 4.35 h.p./sq.in. 0,67 hp/cm² Piston speed (max.) 2,625 ft./min. 13,3 m/sec B.m.e.p. (max.) 109 lb./sq.in. 7,7 kg/cm²		
Rating (take-off)		
Jumo 205-C:	600 h.p./2,200 r.p.m./take-off; 550 h.p./2,100 r.p.m./8,200 ft. (2 500 m) normal rating. Reduction gear ratio 0.73:1. 1-speed supercharger, ratio 7.0:1. Direct fuel injection. 50 to 60 cetane fuel oil.	
Jumo 205-D:	880 h.p./3,000 r.p.m./take-off; 850 h.p./3,000 r.p.m./9,800 ft. (3 000 m) normal rating. Reduction gear ratio 0.61:1. 1-speed supercharger, ratio 8.0:1. Direct fuel injection. 50 to 60 cetane fuel oil.	

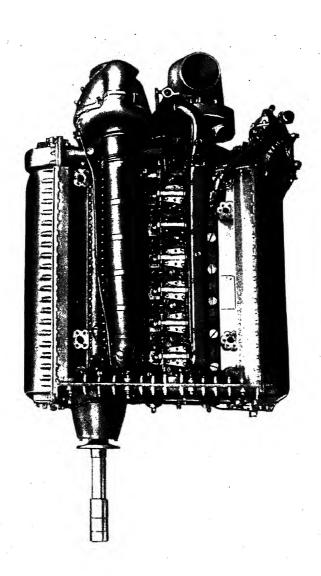


Junkers Jumo 206 (Diesel)

ModelJumo 206.		
Type		
6 removable steel cylinder liner common combustion chamber. exhaust ports around opposite e terbalanced crankshafts suppo	Construction1-piece silumin cylinder block with 2 elektron crankcase covers. 6 removable steel cylinder liners. 2 pistons in each cylinder with common combustion chamber. Piston-controlled inlet ports and exhaust ports around opposite ends of cylinders. 2 6-throw counterbalanced crankshafts supported in 7 plain bearings. Spur reduction gear, ratio 0.63:1. Hydraulic drive to propeller shaft.	
SuperchargerGear-driven 1-speed supercharg	er, ratio 8.0:1.	
Injection Direct fuel injection. 2 Junkers 1-plunger injection pumps and 4 Junkers open-type 2-orifice injectors per cylinder. Injection pressure 8,500 lb./sq.in. (600 kg/cm ²).		
Ignition Compression.		
Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm ²). Dry sump.		
Starter Bosch electric inertia starter.		
Bore	130 mm 2 x 160 mm 25.5 lit 18,0:1 700 mm 1 340 mm 2 260 mm 0,80 m² 750 kg 0,62 kg/hp 160 g/hp/hr 10 g/hp/hr 50 to 60 cetane 20,5 cs 47,1 hp/lit 0,75 hp/cm² 13,9 m/sec 8,2 kg/cm²	
Rating (take-off) 1,200 h.p./2,600 r.p.m. Rating (normal) 1,000 h.p./2,400 r.p.m./9,800 ft. (3 000 m) Rating (cruising) 850 h.p./2,000 r.p.m./9,800 ft. (3 000 m)		

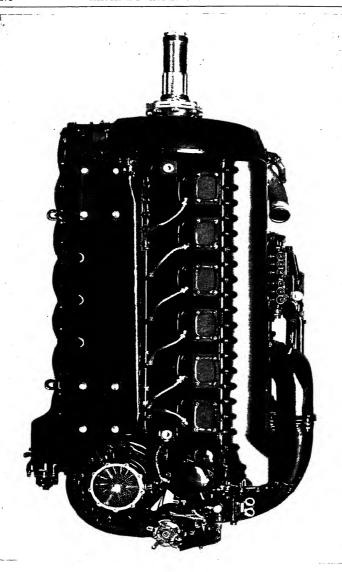
Jumo 208:

1,500 h.p./3,000 r.p.m./take-off: 1,500 h.p./3,000 r.p.m./26,000 ft. (8 000 m) military rating. Geared drive. 1-speed supercharger. ratio 8.0:1. Turbo-supercharger. Direct fuel injection. 50 to 60 cetane fuel oil.



Junkers Jumo 207 (Diesel)

Model	Jumo 207-A.	
	5 (12) cylinders, in-line, wate charged, 2-cycle.	r cooled, geared drive, super-
Construction 1-piece silumin cylinder block with 2 elektron crankcase covers. 6 removable steel cylinder liners. 2 pistons in each cylinder with common combustion chamber. Piston-controlled inlet ports and exhaust ports around opposite ends of cylinders. 2 6-throw counterbalanced crankshafts supported in 7 plain bearings. Spur reduction gear, ratio 0.63:1. Hydraulic drive to propeller shaft.		
	Gear-driven 1-speed superchar; charger.	ger, ratio 8.0:1. Turbo-super-
Injection Direct fuel injection. 2 Junkers 1-plunger injection pumps and 4 Junkers open-type 2-orifice injectors per cylinder. Injection pressure 8,500 lb./sq.in. (600 kg/cm ²).		
Ignition	Compression.	
Lubrication F	Pressure feed, 55-70 lb./sq.in. (4,0-5,0 kg/cm ²). Dry sump.
Starter E	Bosch electric inertia starter.	
Oil consumption (cr. Fuel oil grade Lub. oil grade (visco Output/displacement Output/piston area Piston speed (max.) B.m.e.p. (max.)	2 x 6.30 in. 1,014 cu.in. 130:1 28.3 in. 52.2 in. 36.0 in. 8.7 sq.ft. 1,430 lb. 1.43 lb./h.p./hr. 1.0.37 lb./h.p./hr. 1.0.018 lb./h.p./hr. 1.0018 lb./h.p./hr. 1.00 S.U. secs. 1.099 h.p./cu.in. 1.31 lb./sq.in.	105 mm 2 x 160 mm 16,6 lit 18,0:1 720 mm 1 325 mm 2 325 mm 0,81 m² 650 kg 0,65 kg/hp 170 g/hp/hr 8 g/hp/hr 50 to 60 cetane 20,5 cs 60,1 hp/lit 0,96 hp/cm² 16,0 m/sec 9,2 kg/cm²
Rating (take-off) 1,000 h.p./3,000 r.p.m. Rating (military) 1,000 h.p./3,000 r.p.m./32,800 ft. (10 000 m) Rating (normal)		



Junkers Jumo 211

ModelJumo 211-J.			
Type			
Construction	1-piece silumin crankcase with 2 integral cylinder blocks. Detachable cylinder heads for each block. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.65:1. Hollow propeller shaft for cannon.		
Supercharger	Gear-driven 2-speed supercharger, ratios 7.95:1 and 11.37:1. Automatic boost pressure regulator. Intercooler.		
Injection	Direct fuel injection, 1 Junkers 12-plunger injection pump with automatic mixture control. Fuel de-aerator, 1 Junkers closed-type swirl injector per cylinder.		
Ignition	2 Bosch GE12BRS magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication	Pressure feed, 70-90 lb./sq.in. (5,0 - 6,0 kg/cm ²). Dry sump.	
Starter	Bosch electric inertia starter.		
Fuel consumption (Oil consumption (Casoline grade Oil grade (viscosity Output/displacemen Output/piston area Piston speed (max.		150 mm 165 mm 35,0 lit 7,0:1 1 050 mm 804 mm 1 769 mm 0,58 m ² 648 kg 0,48 kg/hp 205 g/hp/hr 8 g/hp/hr 92 octane 20,5 cs 38,6 hp/lit 0,63 hp/cm ² 14.3 m/sec 13,4 kg/cm ²	
Rating (take-off) 1,350 h.p./2,600 r.p.m. Rating (military, low) . 1,300 h.p./2,500 r.p.m./12,500 ft. (3 800 m) Rating (military, high) . 1,260 h.p./2,500 r.p.m./16,400 ft. (5 000 m) Rating (max. cruising) . 1,000 h.p./2,200 r.p.m./16,400 ft. (5 000 m)			
Jumo 211-A1:	 1: 1,200 h.p./2,300 r.p.m./take-off; 1.025 h.p./2,300 r.p.m./5,600 ft. (1 700 m) and 975 h.p./2,300 r.p.m./13,800 ft. (4 200 m) military rating. Reduction gear ratio 0.65:1. 2-speed supercharger, ratios 7.95:1 and 11.37:1. Direct fuel injection. 92-octane gasoline. 		
Jumo 211-B1:	1,200 h.p./2,400 r.p.m./take-off; 1,200 h.p./2,400 r.p.m./3,300 ft. (1 000 m) and 1,050 h.p./2,400 r.p.m./13,000 ft. (4 000 m) military rating. Reduction gear ratio 0.60:1. 2-speed supercharger, ratios 7.95:1 and 11.37:1. Direct fuel injection. 92-octane gasoline.		
Jumo 211-D1:	Similar to Jumo 211-B1. Reducti	ion gear ratio 0.65:1.	

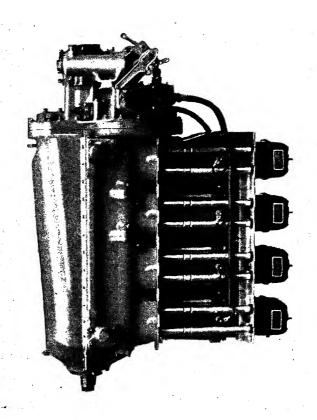
Jumo 211-F1: Similar to Jumo 211-J. No intercooler.



Junkers Jumo 213

Model	Jumo 213-A.	
Type	.12 cylinders, inverted vee 60 degrees, pressure water cooled, geared drive, supercharged, 4-cycle.	
Construction	1-piece silumin crankcase with 2 integral cylinder blocks. Detachable cylinder heads for each block. Steel cylinder liners. 2 inlet valves and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear. Hollow propeller shaft for cannon.	
Supercharger	Gear-driven 2-speed supercharge regulator and intercooler.	ger. Automatic boost pressure
Injection	. Direct fuel injection. 1 Junkers 12-plunger injection pump with automatic mixture control. Fuel de-aerator. 1 closed-type multi-orifice injector per cylinder.	
Ignition2 Bosch magnetos. 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication	Pressure feed, 70-90 lb./sq.in. (5,0 - 6,0 kg/cm ²). Dry sump.
Starter	Bosch electric inertia starter.	
Compression ratio Width Height Length Frontal area Weight Weight Weight/horsepower Fuel consumption (of Casoline grade Oil grade (viscosity Output/displacemer Output/piston area Piston speed (max.)		154 mm 165 mm 36.9 lit 7,0:1 1 060 mm 810 mm 1 800 mm 0,58 m ² 700 kg 0,41 kg/hp 205 g/hp/hr 8 g/hp/hr 92 octane 20,5 - 25,1 cs 46.1 hp/lit 0,76 hp/cm ² 14.8 m/sec 15,7 kg/cm ²
Rating (take-off)		

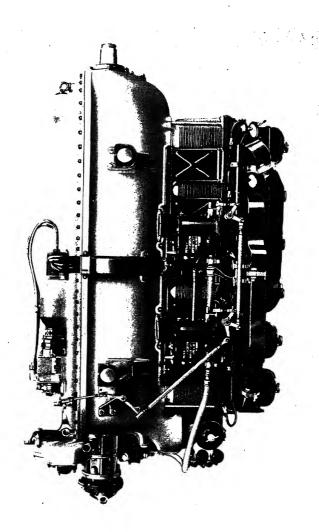
Note: This engine is similar to the Junkers Jumo 211 in general design, except that it has a slightly larger bore giving it a greater displacement.



ModelAlfa 110-1.		
Type 4 cylinders, inverted in-line, air cooled, direct drive, not super-charged, 4-cycle.		
Construction 2-piece elektron crankcase. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 4-throw 1-piece crankshaft supported in 5 plain bearings.		
SuperchargerNone.		
Carburation 1 Mona-Hobson AI48D down control.	draft carburetor with mixture	
Ignition 2 Marelli SA4 magnetos. 2 14-mm short reach spark plugs per cylinder.		
Lubrication Pressure feed, 40-45 lb./sq.in. (2,8-3,2 kg/cm ²). Dry sump.		
Starter		
Oil consumption (cr.) 0.018 lb./h.p./hr. Gasoline grade 73 octane Oil grade (viscosity) 100 S.U. secs. Output/displacement 0.35 h.p./cu.in. Output/piston area 1.91 h.p./sq.in. Piston speed (max.) 2,158 ft./min. B.m.e.p. (max.) 118 lb./sq.in.	118 mm 140 mm 6,1 lit 5,55:1 508 mm 787 mm 1 227 mm 0,36 m ² 136 kg 1,05 kg/hp 240 g/hp/hr 8 g/hp/hr 73 octane 20,5 cs 21,3 hp/lit 0,30 hp/cm ² 11,0 m/sec 9,0 kg/cm ²	
Rating (take-off)		

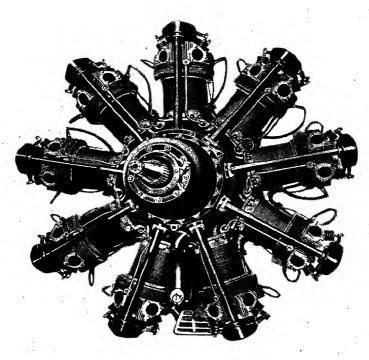


COURTESY AEROSPHERE



ITALY 285

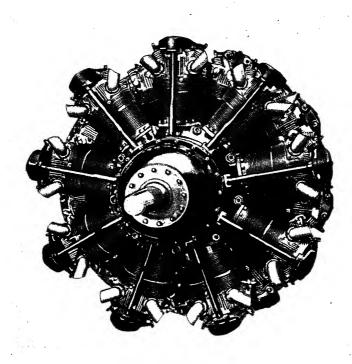
ModelAlfa 115-1.		
Type		
barrels and detachable alur and I exhaust valve per cylin	l-piece elektron crankcase with cover plate. Cylinders with steel barrels and detachable aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bear- ings.	
SuperchargerNone.		
Carburation 2 Mona-Hobson AI48D downdraft carburetors with mixture control.		
Ignition 2 Marelli magnetos. 2 14-mm short reach spark plugs per cylinder.		
Lubrication Pressure feed, 40-45 lb./sq.in. (2,8-3,2 kg/cm ²). Dry sump.		
Starter Hand starter.		
Bore	118 mm 140 mm 9,2 lit 5,5:1 485 mm 805 mm 1 542 mm 0,35 m² 210 kg 1,02 kg/hp 240 g/hp/hr 8 g/hp/hr 73 octane 20,5 cs 23,3 hp/lit 0,31 hp/cm² 11,0 m/sec 8,8 kg/cm²	
Rating (take-off) 205 h.p./2,350 r.p.m. Rating (normal) 195 h.p./2,200 r.p.m./sea level Rating (cruising) 140 h.p./1,500 r.p.m./sea level		



Alfa Romeo Alfa 128

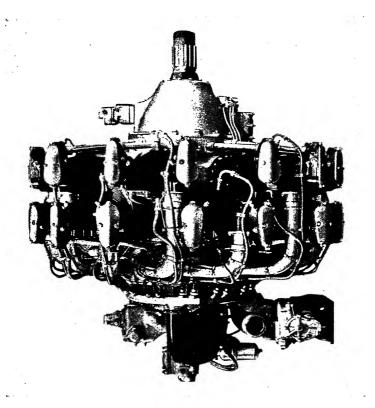
ITALY 287

Model Alfa 128-RC21.		
Type9 cylinders, 1-row radial, air cooled, geared drive, supercharged, 4-cycle.		
Construction 2-piece duralumin crankcase. Cylinders with steel barrels and aluminum alloy heads. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Epicyclic bevel reduction gear, ratio 0.65:1.		
Supercharger Gear-driven 1-speed supercharger, ratio 8.8:1.		
Carburation 1 Mona-Hobson AVT85MC updraft carburetor with automatic boost control.		
Ignition2 Marelli MF9 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.		
Lubrication	Pressure feed, 80 lb./sq.in. (5,6	kg/cm ²). Dry sump.
Starter		
Oil consumption (cr Gasoline grade Oil grade (viscosity Output/displacement Output/piston area	7.50 in. 1,746 cu.in. 7.0:1 55.1 in. 52.3 in. 16.6 sq.ft. 1,138 lb. 1.20 lb./h.p./hr. 2r.) 0.51 lb./h.p./hr. 37 octane 100 S.U. secs. 10.54 h.p./sq.in. 2,867 ft./min.	146 mm 190 mm 28,6 lit 7,0:1 1 400 mm 1 329 mm 1,54 m² 516 kg 0,54 kg/hp 230 g/hp/hr 6 g/hp/hr 87 octane 20,5 cs 33,2 hp/lit 0,63 hp/cm² 14,6 m/sec 13,1 kg/cm²
Rating (take-off)		
	850 h.p./2,300 r.p.m./take-off; 800 h.p./2,300 r.p.m./3,300 ft. (1 000 m) military rating. Geared drive. 1-speed supercharger, ratio 7.0:1. 87-octane gasoline.	
	780 h.p./2,300 r.p.m./take-off; 7 (3 500 m) military rating, Redu supercharger, ratio 10.0:1, 87-oc	ction gear ratio 0.65:1, 1-speed



Alfa Romeo Alfa 135

Model	Alfa 135-RC32.		
Туре	18 cylinders, 2-row radial, air charged, 4-cycle.	cooled, geared drive, super-	
Construction2-piece duralumin crankcase. Cylinders with steel barrels and aluminum alloy heads. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by push rods, 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.50:1.			
Supercharger	chargerGear-driven 1-speed supercharger, ratio 9.26:1.		
Carburation	uration1 Zenith-Stromberg NA-Z160RGSL updraft carburetor with automatic mixture control and boost control.		
Ignition 2 Marelli MF18 magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.			
Lubrication	Pressure feed, 80 lb./sq.in. (5,6	kg/cm ²). Dry sump.	
Starter Garelli compressed air starting system.			
Oil consumption (c Gasoline grade Oil grade (viscosity Output/displacemer Output/piston area Piston speed (max.)		146 mm 160 mm 48,2 lit 6,6:1 1 315 mm 1 788 mm 1,35 m ² 950 kg 0,59 kg/hp 225 g/hp/hr 7 g/hp/hr 87 octane 20,5 cs 33,6 hp/lit 0,52 hp/cm ² 12,8 m/sec 12,7 kg/cm ²	
Rating (take-off)1,620 h.p./2,400 r.p.m. Rating (military)1,400 h.p./2,400 r.p.m./10,500 ft. (3 200 m) Rating (cruising)1,100 h.p./1,900 r.p.m./13,100 ft. (4 000 m)			
Alfa 135-RC34:	1,500 h.p./2,400 r.p.m./take-off; ft. (3 400 m) military rating. charger. 87-octane gasoline.		

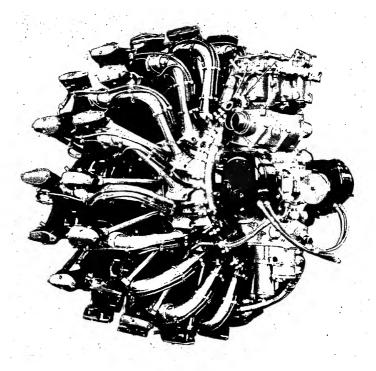


Fiat A74

Model	A74_DC29	
	.14 cylinders, 2-row radial, air charged, 4-cycle.	cooled, geared drive, super-
Construction		
Supercharger	.Gear-driven 1-speed supercharge	er, ratio 8.7:1.
Carburation	.1 Zenith-Stromberg NA-R125R0 tomatic mixture control and boo	GF updraft carburetor with au- ost control.
Ignition	2 Marelli MF14 magnetos. 2 l per cylinder. Shielded ignition s	18-mm short reach spark plugs system.
Lubrication	Pressure feed, 100 lb./sq.in. (7,0	kg/cm ²). Dry sump.
Starter	Garelli compressed air starting	system.
Compression ratio Diameter Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption Oil grade (viscosit Output/displaceme Output/jiston area Piston speed (max		140 mm 145 mm 31,2 lit 6,7:1 1 195 mm 1 510 mm 1,11 m ² 570 kg 0,64 kg/hp 230 g/hp/hr 10 g/hp/hr 10 g/hp/hr 20,5 - 25,1 cs 28,5 hp/lit 0,41 hp/cm ² 12,3 m/sec 10,2 kg/cm ²
Rating (take-off)890 h.p./2,550 r.p.m. Rating (normal)840 h.p./2,400 r.p.m./12,500 ft. (3 800 m) Rating (cruising)620 h.p./2,000 r.p.m./13,100 ft. (4 000 m)		
A74-RC18:	920 h.p./2,520 r.p.m./take-off; (1 800 m) normal rating. Gear 87-octane gasoline.	
A74-RC42:	820 h.p./2,520 r.p.m./take-off; (4 200 m) normal rating. Gear 87-octane gasoline.	
A74-RC138:	Same as A74-RC38. Propeller ro	otates in opposite direction.

1,100 h.p./2,600 r.p.m./take-off: 1,000 h.p./2.500 r.p.m./13,100 ft. (4 000 m) normal rating. Geared drive. 1-speed supercharger. 87-octane gasoline. Note: This engine has a slightly larger displacement than the A74 series engines.

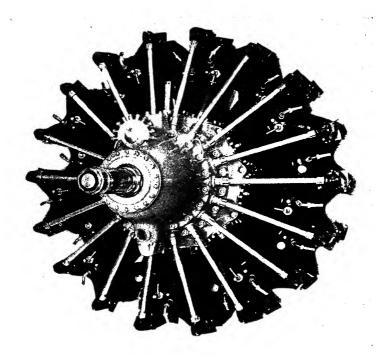
A76-RC40:



Fiat A80

Fiat A80

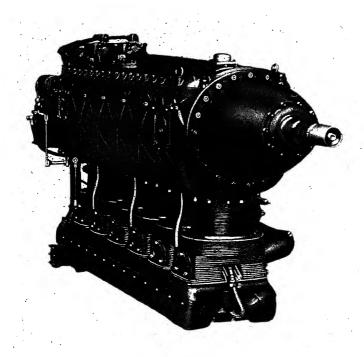
Model	. A80-RC41.	
Type	.18 cylinders, 2-row radial, air charged, 4-cycle.	r cooled, geared drive, super-
Construction	.3-piece duralumin crankcase. Caluminum alloy heads. 1 inlet va cooled) per cylinder actuated counterbalanced crankshaft su Epicyclic bevel reduction gear,	Ive and 1 exhaust valve (sodium by push rods. 2-throw 2-piece apported in 3 roller bearings.
Supercharger	.Gear-driven 1-speed supercharge	er, ratio 9.37:1.
Carburation	.1 Zenith-Stromberg downdraft ture control and boost control.	carburetor with automatic mix-
Ignition	2 Marelli magnetos. 2 18-mm cylinder. Shielded ignition syste	short reach spark plugs per
Lubrication	. Pressure feed, 100 lb./sq.in. (7,0	0 kg/cm ²). Dry sump.
Starter	. Garelli compressed air starting	system.
Compression ratio Diameter Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)	6.50 in. 2,789 cu.in. 6.7:1 52.7 in. 59.3 in. 15.1 sq.ft. 1,598 lb. r. 1.55 lb./h.p. (cr.) 0.48 lb./h.p./hr. cr.) 0.022 lb./h.p./hr. 87 octane y) 100-120 S.U. secs. int 0.37 h.p./cu.in. a 2.40 h.p./sq.in. b) 2,383 ft./min. 133 lb./sq.in.	140 mm 165 mm 48,7 lit 6,7:1 1 340 mm 1 508 mm 1,40 m ² 725 kg 0,70 kg/hp 220 g/hp/hr 10 g/hp/hr 10 g/hp/hr 87 octane 20,5 · 25,1 cs 22,8 hp/lit 0,37 hp/cm ² 12,1 m/sec 9,3 kg/cm ²
Rating (take-off)1,030 h.p./2,200 r.p.m. Rating (normal)1,000 h.p./2,100 r.p.m./13,500 ft. (4 100 m) Rating (cruising)700 h.p./1,800 r.p.m./14,800 ft. (4 500 m)		
A80-RC20:	1,200 h.p./2,200 r.p.m./take-off; (2 000 m) normal rating. Gear ratio 7.14:1. 87-octane gasoline.	ed drive. 1-speed supercharger,



Fiat A82

Fiat A82

Model A82-RC42.		
Type18 cylinders, 2-row radial, charged, 4-cycle.	air cooled, geared drive, super-	
and aluminum alloy heads. I (sodium cooled) per cylinde 1-piece counterbalanced cran	nstruction2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.62:1.	
SuperchargerGear-driven 1-speed superchar	rger, ratio 8.65:1.	
Carburation 1 Zenith-Stromberg downdraf ture control and boost contro	t carburetor with automatic mix-	
Ignition2 Marelli magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.		
Lubrication Pressure feed, 100 lb./sq.in. (7,0 kg/cm ²). Dry sump.	
Starter Garelli compressed air starting	g system.	
Bore	140 mm 170 mm 47,1 lit 6,75:1 1 350 mm 1 500 mm 1 500 mm 1,43 m ² 870 kg 0,62 kg/hp 220 g/hp/hr 10 g/hp/hr 87 octane 20,5 - 25,1 cs 29,7 hp/lit 0,52 hp/cm ² 13,6 m/sec 11,3 kg/cm ²	
Rating (take-off)1,400 h.p./2,400 r.p.m. Rating (normal)1,250 h.p./2,300 r.p.m./13,800 ft. (4 200 m) Rating (cruising)950 h.p./1,900 r.p.m./14,800 ft. (4 500 m)		
A82-RC40: 1,500 h.p./2,400 r.p.m./take-of ft. (4 000 m) normal rating. C 87-octane gasoline.	ff; 1,250 h.p./2,300 r.p.m./13,100 eared drive. 1-speed supercharger.	

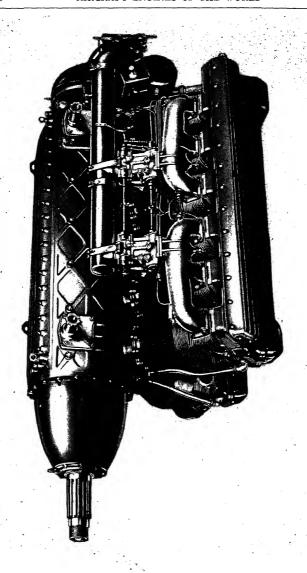


Isotta Fraschini Beta

Isotta Fraschini Beta

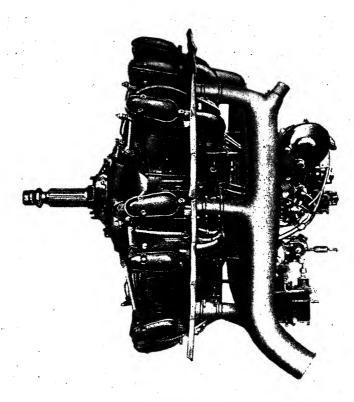
Model Beta.		
Type	air cooled, geared drive, super-	
with steel barrels and aluminu 1 exhaust valve per cylinder a 6-throw 1-piece counterbalanced	1-piece aluminum alloy crankcase with cover plate. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by overhead camshafts. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Planetary reduction gear, ratio 0.79:1.	
Supercharger Gear-driven 1-speed supercharg sure regulator.	charger Gear-driven 1-speed supercharger, ratio 10.0:1. Automatic pressure regulator.	
Carburation 1 Isotta Fraschini updraft carb	ouretor with altitude control.	
Ignition		
Lubrication Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.	
Starter Garelli compressed air starting	system.	
Bore	125 mm 130 mm 9,6 lit 6,5:1 410 mm 800 mm 1 625 mm 0,30 m² 225 kg 0,75 kg/hp 240 g/hp/hr 7 g/hp/hr 7 g/hp/hr 87 octane 20,5 -25,1 cs 31,3 hp/lit 0,41 hp/cm² 11,7 m/sec 10,5 kg/cm²	
Rating (take-off)	00 ft. (1 400 m) 00 ft. (1 400 m)	

Gamma RC35-IDS: 12-cylinder inverted vee version of the Beta from which the latter was developed. 550 h.p./2,600 r.p.m./take-off; 580 h.p./2,730 r.p.m./13,100 ft. (4 000 m) military rating. Reduction gear ratio 0.61:1. 1-speed supercharger, ratio 10.34:1. 87-octane gasoline.



Isotta Fraschini Delta

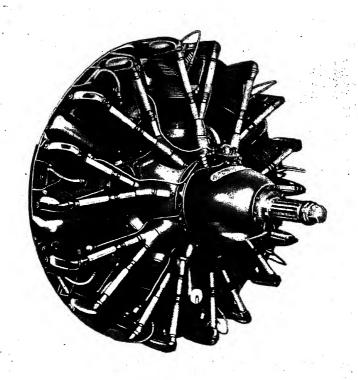
Model	Delta RC35-IDS.	
	.12 cylinders, inverted vee 60 de supercharged, 4-cycle.	egrees, air cooled, geared drive,
Construction	1-piece aluminum alloy crankes with steel barrels and aluminum 1 exhaust valve (sodium cool overhead camshafts. 6-throw 1 shaft supported in 7 plain bear ratio 0.64:1.	n alloy heads. I inlet valve and ed) per cylinder actuated by I-piece counterbalanced crank-
Supercharger	. Gear-driven 1-speed supercharge control.	er, ratio 10.0:1. Automatic boost
Carburation	.4 Isotta Fraschini downdraft ca	arburetors with automatic mix-
Ignition	.2 Marelli magnetos, 2 18-mm cylinder. Shielded ignition syste	short reach spark plugs per m.
Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm2). Dry sump.
Starter	Garelli compressed air starting s	system.
Compression ratio Width Height Length Frontal area Weight / Weight/horsepower Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/jiston area Piston speed (max. B.m.e.p. (max.)		132 mm 160 mm 26,7 lit 6,4:1 840 mm 833 mm 2 000 mm 0,59 m² 510 kg 0,66 kg/hp 225 g/hp/hr 10 g/hp/hr 87 octane 20,5 - 25,1 cs 28,8 hp/lit 0,47 hp/cm² 14,3 m/sec 10,3 kg/cm²
Rating (military)		00 ft. (4 000 m)
Delta RC35-1:	610 h.p./2,230 r.p.m./take-off; (4 000 m) military rating. Gear 87-octane gasoline.	700 h.p./2,500 r.p.m./13,100 ft. ed drive. 1-speed supercharger.
Delta RC35-ICD:	610 h.p./2,240 r.p.m./take-off; 6 (3 500 m) military rating. Redu supercharger, ratio 9.8:1. 87-00 propeller shaft for cannon.	ction gear ratio 0.64:1. 1-speed
Delta RC35-IS:	730 h.p./2,400 r.p.m./take-off; (3 500 m) military rating. Redu supercharger, ratio 9.8:1. 87-or propeller shaft for cannon.	ction gear ratio 0.62:1. 1-speed



Piaggio P.VII

Piaggio P.VII

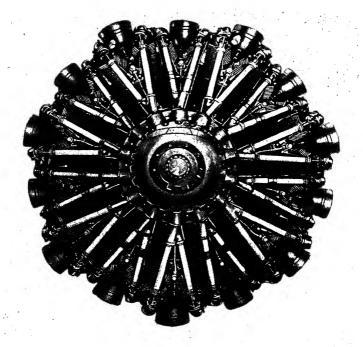
Model P.VII-C35. Type			
4-cycle. Construction 2-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 1-throw 2-piece counterbalanced crankshaft supported in 2 roller bearings. Supercharger Gear-driven 1-speed supercharger, ratio 10.0:1. Carburation 1 Piaggio T2-80 updraft carburetor with automatic boost control. Ignition 2 Marelli MF7 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system. Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump. Starter Garelli compressed air starting system. Bore 5.75 in. 146 mm Stroke 6.50 in. 165 mm Displacement 1,177 cu.in. 19,3 lit. Compression ratio 6.5:1 6,5:1 Diameter 49.6 in. 1 256 mm Length 44.5 in. 1 135 mm Frontal area 13.4 sq.ft. 1,24 m² Weight 783 lb. 355 kg Weight 783 lb. 355 kg Weight/horsepower 1.57 lb./hp./hr. 0,71 kg/hp Fuel consumption (cr.) 0.47 lb./hp./hr. 7 g/hp/hr Gasoline grade 87 octane 87 octane 87 octane 87 octane 87 octane 20,5 - 25,1 cs Output/displacement 0.42 hp./cu.in. 25,9 hp/lit 275 hp./sq.in. 11,5 m/sec 11,1 kg/cm² Piston speed (max.) 2.75 ft./min. 11,5 m/sec 11,1 kg/cm² Piston speed (max.) 2.75 ft./min. 11,5 m/sec 11,1 kg/cm² Rating (take-off) 500 h.p./2,100 r.p.m./11,500 ft. (3 500 m) Rating (cruising) 325 hp./1,700 r.p.m./11,500 ft. (3 500 m) Rating (cruising) 325 hp./1,700 r.p.m./11,500 ft. (3 500 m) Rating (cruising) 325 hp./1,700 r.p.m./11,500 ft. (3 500 m) Rating (cruising) 325 hp./2,100 r.p.m./14,800 ft. (4 500 m) military rating. Geared drive. 2-speed supercharger. 87-octane gasoline. P.VII-C45: 440 h.p./2,100 r.p.m./take-off; 465 h.p./2,100 r.p.m./4,900 ft. (1 500 m) and 390 h.p./2,100 r.p.m./14,800 ft. (4 500 m) military rating. Geared drive. 2-speed supercharger. 87-octane military rating. Geared drive. 2-speed supercharger. 87-octane milit	Model	.P.VII-C35.	
and aluminum alloy heads. 1 inlet valve and 1 exhaust valve	Туре	.7 cylinders, 1-row radial, air cod 4-cycle.	oled, direct drive, supercharged,
Carburation	Construction	and aluminum alloy heads. I inlet valve and I exhaust valve (sodium cooled) per cylinder actuated by push rods. I-throw 2-piece counterbalanced crankshaft supported in 2 roller bear-	
Ignition	Supercharger	.Gear-driven 1-speed supercharge	er, ratio 10.0:1.
Ignition	Carburation	.1 Piaggio T2-80 updraft carburet	tor with automatic boost control.
Starter	Ignition	2 Marelli MF7 magnetos. 2 18-r cylinder. Shielded ignition syste	nm short reach spark plugs per em.
Bore	Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.
Stroke	Starter	Garelli compressed air starting s	system.
Rating (military) Rating (cruising)	Stroke Displacement Compression ratio Diameter Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption Oil grade Oil grade Output/displacemen Output/displacemen Output/piston area Piston speed (max.		165 mm 19,3 lit 6,5:1 1 256 mm 1 135 mm 1,135 mm 1,24 m² 355 kg 0,71 kg/hp 215 g/hp/hr 7 g/hp/hr 87 octane 20,5 - 25,1 cs 25,9 hp/lit 0,43 hp/cm² 11,5 m/sec
(1 600 m) military rating. Direct drive. 1-speed supercharger. 87-octane gasoline. P.VII-C45: 440 h.p./2,100 r.p.m./take-off; 465 h.p./2,100 r.p.m./4,900 ft. (1 500 m) and 390 h.p./2,100 r.p.m./14,800 ft. (4 500 m) military rating. Geared drive. 2-speed supercharger. 87-octane	Rating (military)		
(1 500 m) and 390 h.p./2,100 r.p.m./14,800 ft. (4 500 m) military rating. Geared drive. 2-speed supercharger. 87-octane	P.VII-C16:	(1 600 m) military rating. Dire	460 h.p./2,100 r.p.m./5,200 ft. et drive. 1-speed supercharger.
	P.VII-C45:	(1 500 m) and 390 h.p./2,100 military rating. Geared drive. 2	r.n.m./14.800 ft. (4 500 m)



Piaggio P.X

Piaggio P.X

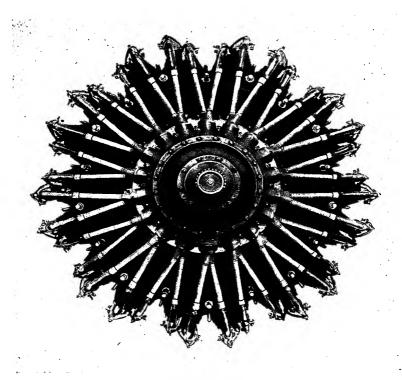
Model	P.X-RC35.	
Туре	9 cylinders, 1-row radial, air coo 4-cycle.	led, geared drive, supercharged,
Construction	2-piece aluminum alloy crankca and aluminum alloy heads. 1 i (sodium cooled) per cylinder z 2-piece counterbalanced cranksl ings. Epicyclic bevel reduction	nlet valve and 1 exhaust valve actuated by push rods. 1-throw haft supported in 2 roller bear-
Supercharger	Gear-driven 1-speed supercharge	er, ratio 7.35:1.
Carburation	.1 Piaggio T2-80 updraft carbure	tor with automatic boost control.
Ignition	.2 Marelli MF9 magnetos. 2 1 per cylinder. Shielded ignition	8-mm short reach spark plugs system.
Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.
Starter	Gareli compressed air starting s	ystem.
Fuel consumption (oil consumption (of Gasoline grade Oil grade (viscosit Output/displaceme Output/displaceme Piston speed (max. B.m.e.p. (max.) Rating (take-off)		146 mm 165 mm 24,9 lit 6,0:1 1 280 mm 1 408 mm 1,29 m ² 430 kg 0,66 kg/hp 220 g/hp/hr 8 g/hp/hr 8 g/hp/hr 87 octane 20,5 - 25,1 cs 26,1 hp/lit 0,43 hp/cm ² 12,4 m/sec 10,6 kg/cm ²
Rating (cruising) .	450 h.p./1,800 r.p.m./11,	500 ft. (3 500 m)
P.IX-RC40:	(1 000 m) and 580 h.p./2.350 r.	600 h.p./2,350 r.p.m./3,300 ft. p.m./13,100 ft. (4 000 m) milispeed supercharger. 87-octane
P.X-R:	670 h.p./2,350 r.p.m./take-off; (1 000 m) normal rating. Redu supercharger, ratio 7.35:1. 87-0	700 h.p./2,300 r.p.m./3,300 ft. action gear ratio 0.62:1. 1-speed ctane gasoline.
P.XVI-RC35D:	700 h.p./2,250 r.p.m./take-off; (3 500 m) military rating. Redsupercharger, ratio 10.0:1. 87-oc	670 h.p./2,250 r.p.m./11,500 ft. uction gear ratio 0.62:1. 1-speed ctane gasoline.
P.XVI-RC35S:	Same as P.XVI-RC35D. Propell	ler rotates in opposite direction.



Piaggio P.XI

Piaggio P.XI

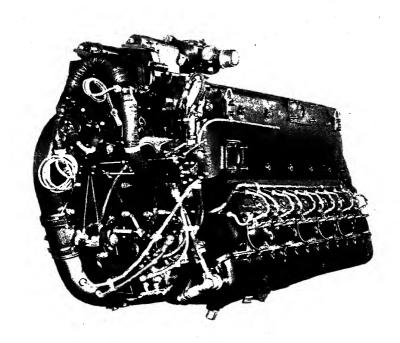
Model	P.XI-RC40.	
Type	14 cylinders, 2-row radial, air charged, 4-cycle.	r cooled, geared drive, super-
Construction	1-piece barrel type duralumin barrels and aluminum alloy her valve (sodium cooled) per cy 2-throw 3-piece counterbalance roller bearings. Epicyclic bevel	ads. I inlet valve and I exhaust dinder actuated by push rods.
Supercharger	.Gear-driven 1-speed supercharg	
Carburation	.1 Piaggio T2-100 dual downd mixture control and boost control	raft carburetor with automatic
Ignition	.2 Marelli MF14 magnetos. 2 I per cylinder. Shielded ignition s	8-mm short reach spark plugs ystem.
Lubrication	Pressure feed, 70 lb./sq.in. (5,0	kg/cm ²). Dry sump.
Starter	Garelli compressed air starting s	system.
Fuel consumption (Oil consumption (Gasoline grade		146 mm 165 mm 38,6 lit 6,0:1 1 328 mm 1 700 mm 1,39 m² 650 kg 0,65 kg/hp 220 g/hp/hr 10 g/hp/hr 87 octane 20,5-25,1 cs 25,9 hp/lit 0,43 hp/cm² 12,1 m/sec 10,8 kg/cm²
Rating (military)	1,000 h.p./2,200 r.p.m1,000 h.p./2,200 r.p.m./13700 h.p./1,800 r.p.m./13,1	,100 ft. (4 000 m) .00 ft. (4 000 m)
P.XI-RC15:	1,200 h.p./2,300 r.p.m./take-off; (1 500 m) military rating. Redusupercharger, ratio 7.9:1. 87-octs	ction gear ratio 0.62:1. 1-speed



Piaggio P.XII

Piaggio P.XII

Model	P.XII-RC35.	
Туре	18 cylinders, 2-row radial, ai charged, 4-cycle.	r cooled, geared drive, super-
Construction	Construction1-piece barrel type duralumin crankcase. Cylinders with steel barrels and aluminum alloy heads, 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 3 roller bearings. Epicyclic bevel reduction gear, ratio 0.62:1.	
Supercharger	. Gear-driven 1-speed supercharg	er, ratio 7.84:1.
Carburation	l Piaggio downdraft carburetor and boost control.	with automatic mixture control
Ignition	2 Marelli AQ18 magnetos. 2 1 per cylinder. Shielded ignition s	8-mm short reach spark plugs
Lubrication	Pressure feed, 70 lb./sq.in. (5,	0 kg/cm ²). Dry sump.
	.Garelli compressed air starting	
Bore		
Rating (take-off)1,500 h.p./2,100 r.p.m. Rating (military)1,350 h.p./2,100 r.p.m./11,500 ft. (3 500 m) Rating (cruising)1,000 h.p./1,700 r.p.m./11,500 ft. (3 500 m)		
P.XII-RC40:	1,600 h.p./2,200 r.p.m./take-off. charger. 87-octane gasoline.	Geared drive, 1-speed super-
P.XXII-RC35D:	1,700 h.p./2,200 r.p.m./take-off; ft. (3 500 m) military rating. R speed supercharger, 87-octane ga a slightly larger displacement th	deduction gear ratio 0.57: 1, 1- asoline. Note: This engine has
P.XXII-RC35R:	Same as P.XXII-RC35D. Propelle	er rotates in opposite direction.

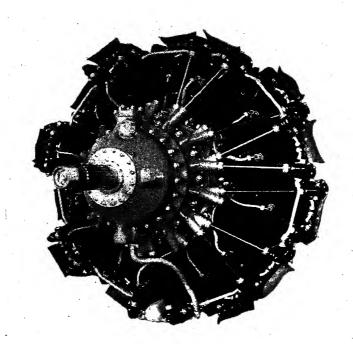


Aichi Atsuta

Aichi Atsuta

Model Atsuta 21.		
Type	degrees, pressure water cooled, ycle.	
blocks with integral heads. Ste and 2 exhaust valves (sodium by overhead camshaft. 6-throw shaft supported in 7 plain bear	.1-piece aluminum alloy crankcase with cover plate. 2 cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain hearings. Spur reduction gear, ratio 0.53:1. Hollow propeller shaft for cannon.	
to 10.08:1. Hydraulic coupling	Gear-driven variable speed 1-stage supercharger, ratio 7.0:1 to 10.08:1. Hydraulic coupling to impeller with degree of slip regulated by automatic altitude control.	
	Injection Direct fuel injection. 1 Bosch type 12-plunger injection pump with automatic altitude control. Fuel de-aerator. 1 Bosch type injector per cylinder.	
Ignition 2 Kokusan magnetos. 2 14-mn cylinder. Shielded ignition syste		
Lubrication Pressure feed, 70 lb./sq.in. (5,0	kg/cm2). Dry sump.	
Starter Kokusan electric inertia starter.	· ·	
Bore	150 mm 160 mm 33,9 lit 7,9:1 712 mm 1 000 mm 1 720 mm 0,50 m ² 635 kg 0,50 kg/hp 205 g/hp/hr 5 g/hp/hr 92 octane 20,5 - 25,1 cs 37,5 hp/lit 0,60 hp/cm ² 13,8 m/sec 13,0 kg/cm ²	
Rating (take-off) 1,200 h.p./2,600 r.p.m./4 Rating (military) 1,100 h.p./2,600 r.p.m./1 Rating (max. cruising)	3,500 II. (4 100 m)	

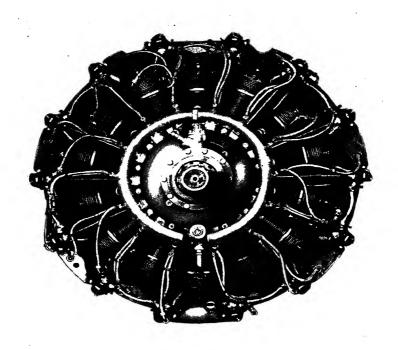
Note: This engine is similar to the Japanese Kawasaki Type 2. These Japanese engines were derived from the German Daimler-Benz DB 601-A engine.



Mitsubishi Kinsei

Mitsubishi Kinsei

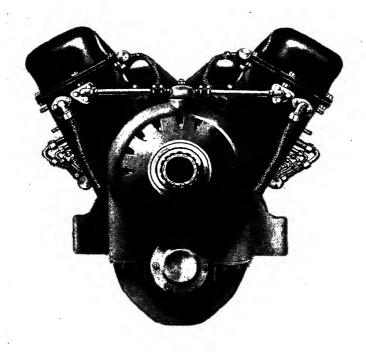
Model	Kinsei 44.	
Type	.14 cylinders, 2-row radial, air charged, 4-cycle.	r cooled, geared drive, super-
Construction	3-piece aluminum alloy crankca and aluminum alloy heads. 1 i (sodium cooled) per cylinder: 3-piece counterbalanced cranksl ings and 1 central ball bear ratio 0.70:1.	nlet valve and 1 exhaust valve actuated by push rods. 2-throw haft supported in 2 roller bear-
Supercharger	Gear-driven 1-speed supercharge	er, ratio 8.48:1.
Carburation	.1 Nakajima 75 downdraft carb control and boost control.	ouretor with automatic mixture
Ignition	2 Kokusan 14BF-2L magnetos. 2 per cylinder. Shielded ignition	2 18-mm long reach spark plugs system.
Lubrication	Pressure feed, 70-100 lb./sq.in.	(5,0 - 7,0 kg/cm ²). Dry sump.
Starter	Kokusan electric inertia starter.	
Compression ratio Diameter Length Frontal area Weight Weight/horsepower Fuel consumption Oil consumption (c Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		140 mm 150 mm 32,3 lit 6,6:1 1 218 mm 1 646 mm 1,17 m² 545 kg 0,51 kg/hp 205 g/hp/hr 10 g/hp/hr 10 g/hp/hr 92 octane 20,5 - 25,1 cs 33.2 hp/lit 0.50 hp/cm² 12,5 m/sec 12,1 kg/cm²
Rating (take-off)		
Kinsei 43:	1,050 h.p./2,500 r.p.m./take-off; (2 000 m) military rating. Redu supercharger. 87-octane gasoling	e. action gear ratio 0.70:1. 1-speed
Kinsei 45, 46:	1,000 h.p./2,600 r.p.m./take-off; ft. (4 300 m) military rating charger. 92-octane gasoline.	1,050 h.p./2,600 r.p.m./14,100 Geared drive. 1-speed super-



Nakajima Sakae

Nakajima Sakae

Model	Sakae 21.	
Type	14 cylinders, 2-row radial, air charged, 4-cycle.	cooled, geared drive, super-
Construction	3-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings and 1 central ball bearing. Planetary reduction gear, ratio 0.69:1.	
Supercharger	Gear-driven 2-speed supercharge	er.
	1 Nakajima 2-barrel downdraft ture control and boost control.	carburetor with automatic mix-
Ignition	. 2 Kokusan 14BF-2L magnetos. 2 18-mm long reach spark plugs per cylinder. Shielded ignition system.	
Lubrication	Pressure feed, 70-100 lb./sq.in.	(5,0-7,0 kg/cm ²). Dry sump.
Starter	Kokusan electric inertia starter.	
Fuel consumption Oil consumption (c Gasoline grade Oil grade (viscosity Output/displacemen Output/piston area Piston speed (max		130 mm 150 mm 27,8 lit 6,5:1 1 120 mm 1 680 mm 0,98 m ² 540 kg 0,47 kg/hp 205 g/hp/hr 10 g/hp/hr 10 g/hp/hr 12 octane 20,5 - 25,1 cs 41,3 hp/lit 0,62 hp/cm ² 13,5 m/sec 14,0 kg/cm ²
Rating (take-off)1,150 h.p./2,700 r.p.m. Rating (military)950 h.p./2,700 r.p.m./19,700 ft. (6 000 m) Rating (cruising)700 h.p./2,200 r.p.m./19,700 ft. (6 000 m)		
Sakae 11:	980 h.p./2,600 r.p.m./take-off; 93 000 m) military rating. Redusupercharger, ratio 7.5:1. 87-oct	iction gear ratio 0.69:1. 1 speed
Sakae 12:	1,000 h.p./2,600 r.p.m./take-off; (4 000 m) military rating. Redu supercharger, ratio 7.5:1. 92-octs	ction gear ratio 0.69:1. 1-speed
Sakae 22:	Same as Sakae 21.	



AM-38

nevised

AM-38

Model	. AM-38A.			
Type	.12 cylinders, vee 60 degrees, water cooled, geared drive, supercharged, 4-cycle.			
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 2 exhaust valves (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crank- shaft supported in 7 plain bearings. Spur reduction gear.			
Supercharger	uperchargerGear-driven 2-speed supercharger.			
Carburation 4 pressure type carburetors.				
Ignition2 Electrozavod magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.				
Lubrication Pressure feed, 85 lb./sq.in. (6,0 kg/cm ²). Dry sump.				
Starter	Electric inertia starter.	•		
Compression ratio Width Height Length Frontal area Weight/horsepower Weight/horsepower Fuel consumption Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max		160 mm 190 mm 45,9 lit 77,0:1 770 mm 1 000 mm 2 000 mm 0,54 m ² 830 kg 0,52 kg/hp 220 g/hp/hr 10 g/hp/hr 95 octane 20,5 · 25,1 cs 34,9 hp/lit 0.66 hp/cm ² 14,2 m/sec 14,1 kg/cm ²		
Rating (take-off)				
AM-35:	M-35: 1,200 h.p./2,250 r.p.m./take-off; 1,100 h.p./2,250 r.p.m./6,600 ft. (2 000 m) and 1,100 h.p./2,250 r.p.m./13,100 ft. (4 000 m) military rating. Geared drive. 2-speed supercharger. 87-octane gasoline.			

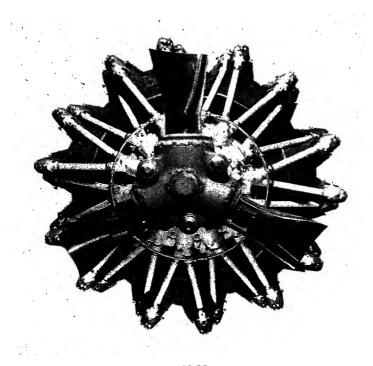
AM-35A:

1,350 h.p./2,250 r.p.m./take-off; 1,200 h.p./2,250 r.p.m./6,600 ft. (2 000 m) and 1,000 h.p./2,250 r.p.m./16,400 ft. (5 000 m) military rating. Geared drive. 2-speed supercharger. 95-octane gasoline.

AM-38B:

1,500 h.p./2,250 r.p.m./take-off; 1,500 h.p./2,250 r.p.m./6,600 ft. (2 000 m) military rating. Geared drive. 1-speed supercharger. 95-octane gasoline.

Note: These engines were developed from the 900 h.p. Mikouline AM-34 which was exhibited at the Paris Aero Show in 1936.

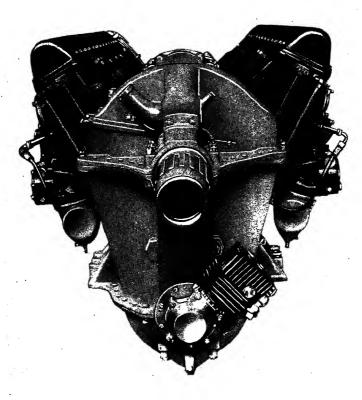


M-88

M-88

ModelM-88.			
Type	.14 cylinders, 2-row radial, air charged, 4-cycle.	cooled, geared drive, super-	
Construction 3-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve (sodium cooled) per cylinder actuated by push rods. 2-throw 3-piece counterbalanced crankshaft supported in 2 roller bearings. Planetary reduction gear, ratio 0.67:1.			
SuperchargerGear-driven 2-speed supercharger.			
Carburation 1 updraft carburetor with automatic boost control and altitude control.			
Ignition2 Electrozavod magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication Pressure feed, 70 lb./sq.in. (5,0 kg/cm²). Dry sump.			
Starter Electric inertia starter.			
Compression ratio. Diameter		146 mm 165 mm 38,7 lit 6,1:1 1 290 mm 1 500 mm 1,30 m ² 680 kg 0,62 kg/hp 220 g/hp/hr 8 g/hp/hr 95 octane 25,1 cs 28,4 hp/lit 0,47 hp/cm ² 13,2 m/sec 10,7 kg/cm ²	
Rating (take-off)			
M-85:	1,000 h.p./2,300 r.p.m./take-off; 1,000 h.p./2,300 r.p.m./13,100 ft. (4 000 m) military rating. Reduction gear ratio 0.50:1. 1-speed supercharger, ratio 9.5:1. 87-octane gasoline.		
M-87B:	Similar to M-88.		

Note: These engines are similar to the French Gnome-Rhone 14N engine from which they were developed.

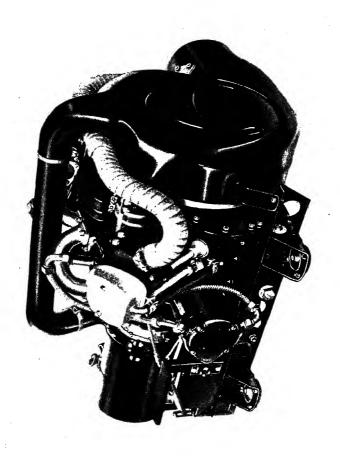


M-105

M-105

Model	M-105P.			
	12 cylinders, vee 60 degrees, ethylene glycol cooled, geared drive, supercharged, 4-cycle.			
Construction	2-piece aluminum alloy crankcase. 2 aluminum alloy cylinder blocks with integral heads. Steel cylinder liners. 2 inlet valves and 1 exhaust valve (sodium cooled) per cylinder actuated by overhead camshaft. 6-throw 1-piece counterbalanced crankshaft supported in 7 plain bearings. Spur reduction gear, ratio 0.59:1. Hollow propeller shaft for cannon.			
Supercharger	Gear-driven 2-speed supercharger, ratios 7.85:1 and 10.0:1.			
	6 updraft carburetors with automatic pressure regulators for altitude control.			
Ignition	2 Electrozavod magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system.			
Lubrication	Pressure feed, 85 lb./sq.in. (6,0 kg/cm ²). Dry sump.			
Starter	Electric inertia starter.			
Fuel consumption (Oil consumption (Gasoline grade Oil grade (viscosit Output/displaceme Output/piston area Piston speed (max B.m.e.p. (max.)		150 mm 170 mm 36,0 lit 77,0:1 777 mm 960 mm 2 027 mm 0,51 m ² 575 kg 0,52 kg/hp 220 g/hp/hr 8 g/hp/hr 8 g/hp/hr 95 octane 20,5 cs 30,5 hp/lit 0,52 hp/cm ² 14,7 m/sec 10,7 kg/cm ² 36 in. (980 mm) Hg. boost		
Rating (take-off)1,100 h.p./2,600 r.p.m./38.6 in. (980 mm) Hg. boost Rating (military, low)1,100 h.p./2,700 r.p.m./6,600 ft. (2 000 m) Rating (military, high)1,050 h.p./2,700 r.p.m./13,100 ft. (4 000 m) Rating (normal, low)950 h.p./2,600 r.p.m./6,600 ft. (2 000 m) Rating (normal, high)945 h.p./2,600 r.p.m./13,100 ft. (4 000 m)				
M-100:	900 h.p./2,400 r.p.m./take-off; (2 000 m) military rating. Gen 87-octane gasoline. Hollow prope	red drive. 1-speed supercharger.		
M-103:	1,000 h.p./2,400 r.p.m./take-off; (3 600 m) military rating. Gear 95-octane gasoline. Hollow prope	red drive. 1-speed supercharger.		
M-105R:	Same as M-105P, but does not cannon.			
M-107:	1,200 h.p./2,700 r.p.m./take-off; (2,000 m) and 1,100 h.p./2,70 military rating. Geared drive. gasoline. Hollow propeller shaft	0 r.p.m./16,400 ft. (5 000 m) 2-speed supercharger. 95-octane		

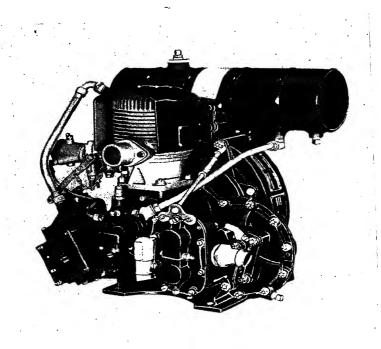
Note: These engines are similar to the French Hispano-Suiza 12Y engine from which they were developed.



Andover, Series V-32

Country United States of America.			
Model V-32.			
Type (engine) 2 cylinders, vee 90 degrees, air cooled, geared drive, not super-charged, 4-cycle.			
Construction l-piece aluminum alloy crankcase. Cylinders with steel barrels and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by push rods. 1-throw 1-piece counterbalanced crankshaft supported in 2 plain bearings. Spur step-up gear, ratio 1.95:1.			
Supercharger None.			
Carburation 1 Andover KB10000 2-choke updraft carburetor with manual altitude control.			
Ignition1 Wico Rem 1574 magneto. 1 18-mm short reach spark plug per cylinder. Shielded ignition system.			
Lubrication Pressure feed, 60 lb./sq.in. (4,2 kg/cm ²). Wet sump.			
Starter Hand starter or motorizing generator.			
Displacement	70 mm 68 mm 0,52 lit 7,8:1 520 mm 418 mm 762 mm 55 kg 11 kg/kw 0,63 kg/kw/hr 14 g/kw/hr 87-100/130 grade 11,7 cs 28,8 hp/lit 0,20 hp/cm ² 7,2 m/sec 8,3 kg/cm ²		
Rating (maximum)15 h.p./3,200 r.p.m./sea level Rating (continuous)10 h.p./3,200 r.p.m./sea level			
Output (overload)			

The engine is coupled through a geared step-up drive to a 28.5 volt D.C. AAF P-2 (Eclipse 915) aircraft type electric generator. The unit is mounted horizontally. Cooling is by means of a fan and ducts with baffles around the cylinders. An automatic voltage regulator controls the electric power generated to suit the 24-volt system on the airplane.



Eclipse, Series NEG

Eclipse, Series NEG

Country...... United States of America. Model NEG-1 (Model 3017). Type (engine) l cylinder, vertical, air cooled, direct drive, not supercharged, 2-cycle. Construction 1-piece aluminum alloy crankcase with cover plate. Cylinder of cast aluminum with integral head. Steel cylinder liner. Crankcase compression with transfer passage and port in cylinder wall. Piston with deflector on head. 1-throw 1-piece counter-balanced crankshaft supported in 2 ball bearings. Supercharger None. Carburation 1 Tillotson straight tube carburetor. Ignition........ 1 Bendix-Scintilla S-1 magneto. 1 18-mm (Aero) short reach spark plug. Shielded ignition system. Lubrication Lubricating oil mixed with the gasoline, ratio 1:10. Starter Pull rope. 63 mm 63 mm 0,20 lit Compression ratio6.0:1 6,0:1 Width16.1 in. 408 mm 509 mm 404 mm Weight of unit (net)63 lb. 29 kg 1 Weight/kw. output (cont.) 21.0 lb./kw. 9,5 kg/kw 0,77 kg/kw/hr Fuel consumption (cont.) . 1.7 lb./kw./hr. Oil consumption (cont.) . . 0.13 lb./kw./hr. 59 g/kw/hr 87-100/130 grade Gasoline grade87-100/130 grade Oil grade (viscosity)40-100 S.U. secs. 4,3 - 20,5 cs 21,2 hp/lit 0,13 hp/cm² Output/displacement0.35 h.p./cu.in. 8,4 m/sec 4.8 kg/cm² B.m.e.p. (max.)69 lb./sq.in. Rating (maximum)4.25 h.p./4,000 r.p.m./sea level Rating (continuous)4.0 h.p./4,000 r.p.m./sea level Output (overload)None. Output (continuous) ... 3 kw. 28.5 v. D.C., or 3 kw. 120 v. A.C./sea level

The engine is direct coupled to an Eclipse 638-1 D.C.-A.C. electric generator. The unit is mounted horizontally. Cooling is by means of an integral blower fan. The remote control system is automatic and the engine speed is regulated by a centrifugal governor. Automatic voltage regulators control the electric power generated to suit both 24-volt and 120-volt systems on the airplane. An additional power take-off geared at 0.345 times engine speed is provided.

NEG-1A (Model 3359): Same as NEG-1 (Model 3017). The gasoline is obtained from the main airplane supply tanks and is fed to the engine through an auxiliary float chamber while the lubricating oil is fed to the carburetor air horn from a tank mounted on the engine with an integral metering pump.

NEG-1A (Model 3359-1): Same as NEG-1A (Model 3359).

NEG-1A (Type 542 Model 1): Same as NEG-1A (Model 3359-1).

NEG-2 (Type 542 Model 2): Same as NEG-1A (Model 3359-1). The engine of this unit has continuous rating of 4.25 h.p./4,000 r.p.m./sea level.



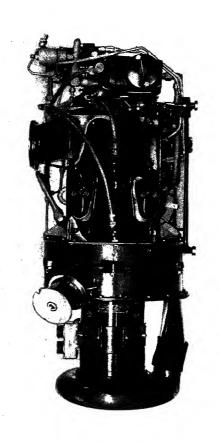
Lawrance, Series 30C

Country United States of America. Model 30C-1. Type (engine) 2 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle, Construction 2-piece aluminum alloy crankcase divided horizontally. Cylinders with steel barrels and aluminum alloy heads. I inlet valve and I exhaust valve per cylinder actuated by push rods. 2-throw 1-piece counterbalanced crankshaft supported in 2 plain bear-Supercharger None. Carburation 1 Bendix-Stromberg NA-H1E carburetor with automatic mixture control. Ignition 2 Bendix-Scintilla SF2RN-10 magnetos. 2 18-mm short reach spark plugs per cylinder. Shielded ignition system. Lubrication Pressure feed, 60 lb./sq.in, (4,2 kg/cm²). Dry sump. Starter Hand starter or motorizing generator. 67 mm 70 mm 0,49 lit Displacement30 cu.in. 9,0:1 Compression ratio9.0:1 762 mm 406 mm Width30.0 in. 914 mm 97 kg 19,3 kg/kw Fuel consumption (cont.) .1.3 lb./kw./hr. Oil consumption (cont.) .0.06 lb./kw./hr. 0.59 kg/kw/hr 28 g/kw/hr Gasoline grade87-100/130 grade 87-100/130 grade Oil grade (viscosity)65-80 S.U. secs. 11,7 - 15,6 cs Output/displacement0.50 h.p./cu.in. 30,6 hp/lit 0.21 hp/cm² Output/piston area1.40 h.p./sq.in. Piston speed (max.) ...1,879 ft./min. B.m.e.p. (max.)99 lb./sq.in. 9,6 m/sec 7.0 kg/cm² Rating (maximum) ...15 h.p./4,000 r.p.m./sea level
Rating (continuous) ...10 h.p./4,000 r.p.m./sea level
Rating (at altitude)5.7 h.p./4,000 r.p.m./20,000 ft. (6 100 m) Output (overload) 7.5 kw. 28.5 v. D.C./sea level Output (continuous) ...5.0 kw. 28.5 v. D.C./sea level
Output (at altitude) ...2.85 kw. 28.5 v. D.C./20,000 ft. (6 100 m)

The engine is direct coupled to a 28.5 volt D.C. aircraft type electric generator. The unit is mounted horizontally in a soundproof enclosure. Cooling is by means of an axial-flow fan mounted on the generator armature. The remote control system is automatic and the engine is regulated by a mechanical governor. An automatic voltage regulator controls the electric power generated to suit the 24-volt system on the airulane.

30C-2: Same as 30C-1.

30C-4, 30C-5: Same as 30C-1 and 30C-2. For use at altitudes of not more than 10.000 ft. (3 000 m).



Lawrance, Series 30D

Country United States of America.

Model 30D-1.

Type (engine)2 cylinders, horizontally opposed, air cooled, direct drive, not

supercharged, 4-cycle.

Construction 2-piece aluminum alloy crankcase divided horizontally. Cylinders with steel barrels and aluminum alloy heads, I inlet valve and I exhaust valve per cylinder actuated by push rods, 2-throw 1-piece counterbalanced crankshaft supported in 2 plain bear-

Supercharger None.

Carburation 1 Bendix-Stromberg NA-H1E carburetor with automatic mixture

control.

spark plugs per cylinder. Shielded ignition system.

Lubrication Pressure feed, 60 lb./sq.in. (4,2 kg/cm²). Dry sump.

67 mm 70 mm Displacement30 cu.in. 4.9 lit Compression ratio.....9.0:1 9.0:1 660 mm Height16.0 in. 406 mm 991 mm 97 kg Weight of unit (net)....214 lb. Weight/kw. output (cont.) 42.8 lb./kw. 19,4 kg/kw Fuel consumption (cont.) 1.2 lb./kw./hr. Oil consumption (cont.) 0.06 lb./kw./hr. 0,54 kg/kw/hr 28 g/kw/hr Gasoline grade87-100/130 grade 87-100/130 grade Oil grade (viscosity) 65-80 S.U. secs. 11,7 - 15,6 cs Output/displacement0.50 h.p./cu.in. 30,6 hp/lit Output/piston area1.40 h.p./sq.in. 0,21 hp/cm² Piston speed (max.)1,879 ft./min. B.m.e.p. (max.)99 lb./sq.in. 9,6 m/sec 7.0 kg/cm²

Rating (maximum)15 h.p./4,100 r.p.m./sea level
Rating (continuous)10 h.p./4,000 r.p.m./sea level
Rating (at altitude)7.5 h.p./4,000 r.p.m./20,000 ft. (6 100 m)

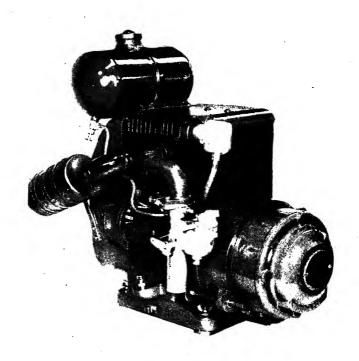
Output (overload) 7 kw. 28.5 v. D.C./sea level

Output (continuous)5 kw. 28.5 v. D.C./sea level Output (at altitude)2.5 kw. 28.5 v. D.C./20,000 ft. (6 100 m)

The engine is direct coupled to a 28.5 volt D.C. AAF P-1 aircraft type electric generator. The unit is mounted horizontally in a soundproof enclosure. Any generator having a standard 6.0 in. (152 mm) S.A.E. mounting flange can be used. Cooling is by means of a specially designed suction system. The remote control system is automatic and the engine speed is regulated by a mechanical governor. An automatic voltage regulator controls the electric power generated to suit either the 24-volt or the 120-volt system on the airplane.

30D:

Similar to 30D-1. Constructed to utilize an Eclipse NEA-3 electric generator in addition to those used on the 30D-1 unit. No soundproof enclosure.



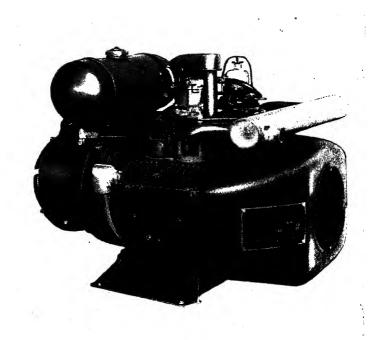
Onan, Series 1C

Onan, Series 1C

```
Country . . . . . . . United States of America.
Model . . . . . . . . . 1C-68S.
Type (engine) ....1 cylinder, vertical, air cooled, direct drive, not supercharged,
                     4-cycle.
Construction ......l-piece aluminum alloy crankcase with separable end bearing
                     plate. L-type aluminum alloy cylinder with cast iron liner and
                     aluminum alloy head. I inlet valve and I exhaust valve actuated
                     by tappets. 1-throw 1-piece counterbalanced crankshaft sup-
                     ported in 2 plain bearings.
Supercharger . . . . None.
Carburation . . . . . . 1 Zenith IAIM updraft carburetor.
Ignition . . . . . . . . 1 Onan 1C flywheel type magneto, 1 14-mm short reach spark
                     plug. Shielded ignition system.
Lubrication ..... Pressure feed, 15 lb./sq.in. (1,0 kg/cm<sup>2</sup>). Wet sump.
Starter ..... Hand or motorizing generator.
57 mm
57 mm
                                                        0,15 lit
Displacement .......... 9 cu.in.
Compression ratio......5.0:1
                                                        5,0:1
                                                        267 mm
Width ..., 10.5 in.
496 mm
                                                        406 mm
                                                        28 kg
47 kg/kw
Weight of unit (net) .... 62 lb.
Weight/kw. output (cont.) 103 lb./kw.
Fuel consumption (cont.) .2.0 lb./kw./hr. Oil consumption (cont.) .0.03 lb./kw./hr.
                                                        0,91 kg/kw/hr
                                                        14 g/kw/hr
Gasoline grade .........73-100/130 grade
                                                        73-100/130 grade
Oil grade (viscosity) . . . . 40 S.U. secs.
                                                        4,3 cs
                                                        12,7 hp/lit
Output/displacement ....0.21 h.p./cu.in.
Output/piston area .....0.48 h.p./sq.in.
                                                        0,07 hp/cm<sup>2</sup>
Piston speed (max.).....975 ft./min.
                                                        4,9 m/sec
4,5 kg/cm<sup>2</sup>
B.m.e.p. (max.) .........64 lb./sq.in.
Rating (maximum) ......1.9 h.p./2,600 r.p.m./sea level
Rating (continuous) ....1.1 h.p./2,200 r.p.m./sea level
Rating (at altitude) .....0.9 h.p./2,200 r.p.m./10,000 ft. (3 000 m)
Output (overload) ....0.72 kw. 24 v. D.C./sea level Output (continuous) ....0.60 kw. 24 v. D.C./sea level
Output (at altitude) ..... 0.43 kw. 24 v. D.C./10,000 ft. (3 000 m)
```

The engine is direct connected to a 24-28 volt D.C. Onan electric generator. The unit is mounted horizontally, Gooling is by means of a centrifugal blower, Push button start and stop. The engine speed is regulated by a mechanical governor. The voltage is regulated by the battery being charged.

Note: The above data applies to one model of the series equipped with Onan IC engines. Other D.C. and A.C. models are available in various ratings and in any voltage or frequency, hand cranked and self-starting remote control. Standard ratings include 350, 400, 500 and 600 watts; 6-8, 12-15, 32-40 and 110 volts D.C.; 110 volts A.C.; 50, 60 and 400 cycles. Dimensions, weights and other data differ according to the model.



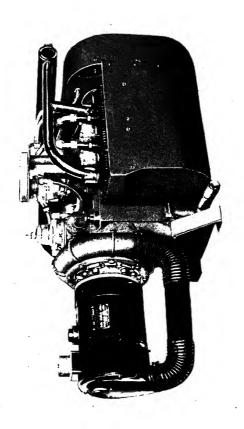
Onan, Series OTC

Onan, Series OTC

Country United States of America. Model OTC-80E. Type (engine) ... 2 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle. Construction l-piece aluminum alloy crankcase with separable end bearing plate. L-type aluminum alloy cylinders with cast iron liners and aluminum alloy heads. 1 inlet valve and 1 exhaust valve per cylinder actuated by tappets. 2-throw 1-piece crankshaft supported in 2 plain bearings. Supercharger.....None. Carburation 1 Marvel-Schebler VD-10 downdraft carburetor with altitude compensator. Ignition 1 Onan OTC flywheel type magneto. 1 14-mm short reach spark plug per cylinder. Shielded ignition system. Lubrication Pressure feed, 20 lb./sq.in. (1,4 kg/cm²). Dry sump. Starter Hand or motorizing generator. 70 mm 57 mm 0.44 lit Compression ratio5.9:1 5.9:1 Width18.0 in. 457 mm 418 mm 584 mm 51 kg 21 kg/kw Weight of unit (net)....113 lb. Weight/kw. output (cont.) 56.5 lb./kw. Fuel consumption (cont.) .1.5 lb./kw./hr. Oil consumption (cont.) .0.03 lb./kw./hr. 0,68 kg/kw/hr 14 g/kw/hr 73·100/130 grade Gasoline grade73-100/130 grade Oil grade (viscosity) 60 S.U. secs. 10,3 cs Output/displacement0.20 h.p./cu.in. 12,0 hp/lit Output/piston area 0.45 h.p./sq.in. 0,07 hp/cm² Piston speed (max.) 975 ft./min. 4.9 m/sec 4.3 kg/cm² Rating (maximum) ...5.3 h.p./2,600 r.p.m./sea level
Rating (continuous) ...4.0 h.p./2,500 r.p.m./sea level
Rating (at altitude) ...3.5 h.p./2,500 r.p.m./10,000 ft. (3 000 m) Output (overload)2.4 kw. 28.5 v. D.C./sea level Output (continuous)2.0 kw. 28.5 v. D.C./sea level Output (at altitude)1.3 kw. 28.5 v. D.C./10,000 ft. (3 000 m)

The engine is direct connected to a 28.5 volt D.C. Onan electric generator. The unit is mounted horizontally. Cooling is by means of centrifugal blowers. Starting and stopping is by means of push button remote control. The engine speed is regulated by a mechanical governor. The voltage is controlled by an automatic voltage regulator.

Note: The above data applies to one model of a series equipped with Onan OTC engines. Other D.C. and A.C. models are available in various ratings and in any voltage or frequency, hand cranked or self-starting remote control. Standard ratings include: 1,500 or 2,000 watts; 6-8, 12-15, 24-30, 38 and 115 volts D.C.; 80, 110 and 220 volts A.C.; 60, 180, 300, 400, 500 and 800 cycles; 1 and 3-phase. Dimensions, weights and other data differ according to the model.

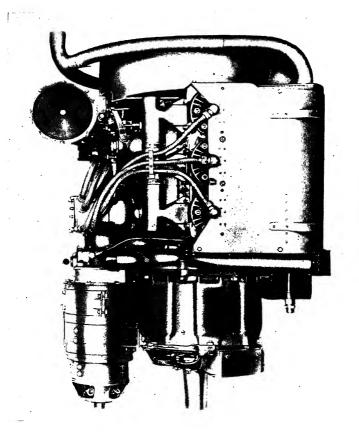


Onan, Series OFA

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Country ..... United States of America.
Model . . . . . . . . . OFA-90.
Type (engine) ....4 cylinders, horizontally opposed, air cooled, geared drive, not
                    supercharged, 4-cycle.
Construction . . . . . 1-piece aluminum alloy crankcase with separable end bearing
                    plate. L-type cast iron cylinders with aluminum alloy heads.
                    I inlet valve and I exhaust valve per cylinder actuated by tap-
                    pets. 4-throw 1-piece crankshaft supported in 3 plain bearings.
Supercharger . . . . None.
Carburation . . . . . 1 Marvel-Schebler VD-10 downdraft carburetor with altitude
                    compensator.
Ignition . . . . . . . . 1 Auto-Lite IGW 4171-6X distributor and coil. 1 14-mm short
                    reach spark plug per cylinder. Shielded ignition system.
Lubrication . . . . . Pressure feed, 20 lb./sq.in. (1,4 kg/cm<sup>2</sup>). Dry sump.
Starter ..... Motorizing generator.
70 mm
57 mm
0.87 lit
Displacement ..........53 cu.in.
                                                      5,9:1
Compression ratio . . . . . . . . 5.9:1
                                                      457 mm
Width ......18.0 in.
457 mm
940 mm
Weight of unit (net)....200 lb.
                                                      91 kg
Weight/kw. output (cont.) 40.0 lb/kw.
Fuel consumption (cont.) 1.9 lb/kw./hr.
Oil consumption (cont.) .0.04 lb./kw./hr.
                                                      18 kg/kw
                                                      0,86 kg/kw/hr
                                                      18 g/kw/hr
73-100/130 grade
Gasoline grade 73-100 130 grade
Oil grade (viscosity) 60 S.U. secs.
Output/displacement 0.25 h.p./cu.in.
Output/piston area 0.57 h.p./sq.in.
                                                      10,3 cs
15,5 hp/lit
                                                      0,09 hp/cm<sup>2</sup>
Piston speed (max.) .....1,088 ft./min.
                                                      5.5 m/sec
B.m.e.p. (max.) .........68 lb./sq.in.
                                                      4.8 kg/cm<sup>2</sup>
Rating (maximum) ...13.5 h.p./2,900 r.p.m./sea level Rating (continuous) ...11.7 h.p./2,800 r.p.m./sea level
Rating (at altitude) .....9.2 h.p./2,800 r.p.m./10,000 ft. (3 000 m)
Rating (at altitude) .....6.5 h.p./2,800 r.p.m./18,000 ft. (5 500 m)
```

The engine is connected through a step-up gear to a 28.5 volt D.C. aircraft type electric generator. The unit is mounted horizontally. Cooling is by means of centrifugal blowers. Starting and stopping is by push button remote control. The engine speed is regulated by a mechanical governor. The voltage is controlled by an automatic voltage regulator.

Note: The above data applies to one model of a series equipped with Onan OFA engines. Other D.C. and A.C. models are available in various ratings and in any voltage or frequency. Standard ratings include 24-30, 38 and 115 volts D.C.; 80, 110 and 220 volts A.C.; 60, 180, 300, 400, 500 and 800 cycles; 1 and 3-phase. Dimensions, weights and other data differ according to the model.



Rotol, Series P-6

Country Great Britain.						
Model						
Type (engine) 6 cylinders, horizontally opposed, air cooled, direct drive, not supercharged, 4-cycle.						
Construction 2-piece aluminum alloy crankcase divided vertically. Cylinders with steel barrels and detachable aluminum alloy heads. 1 4-port reciprocating and oscillating single-sleev valve per cylinder. 3 inlet ports and 2 exhaust ports around mid-section of cylinder barrel. 1-piece 6-throw crankshaft supported in 4 plain bearings and 1 ball bearing.						
SuperchargerNone.						
Carburation 1 Zenith 48AGP downdraft carburetor with automatic altitude control compensating to 25,000 ft. (7 600 m).						
Ignition 1 Rotax BR2-6RAF magneto. Provision for 2 14-mm short reach spark plugs per cylinder. Shielded ignition system.						
Lubrication Pressure feed, 40-50 lb./sq.in. (2,8-3,5 kg/cm ²). Dry sump.						
StarterRotax CO-706 direct cranking electric starter.						
Bore 3.375 in. 86 mm Stroke 3.00 in. 76 mm Displacement 161 cu.in. 2,6 lit Compression ratio 7.8:1 7,8:1 Width 28.0 in. 711 mm Height 39.5 in. 1 003 mm Length 42.7 in. 1 086 mm Weigh of unit (net) 500 lb. 227 kg Weight/kw output (cont.) 21.3 lb/kw. 9,7 kg/kw Fuel consumption (cont.) 0.92 lb/kw./hr. 0,42 kg/kw/hr Oil consumption (cont.) 0.04 lb/kw./hr. 18 g/kw/hr Gasoline grade 87-100/130 (D.T.D. 230-D.E.D. 2475) Oil grade (viscosity) 100 S.U. (D.T.D. 472-B) 20,5 cs Output/displacement 0.60 hp./cu.in. 36,9 hp/lit Output/piston area 1.77 h.p./sq.in. 0,27 hp/cm² Piston speed (max.) 2,125 ft./min. 10,8 m/sec B.m.e.p. (max.) 112 lb./sq.in. 7,9 kg/cm²						
Rating (maximum)96 h.p./4,250 r.p.m./sea level Rating (normal)60 h.p./3,750 r.p.m./sea level Rating (at altitude)60 h.p./3,750 r.p.m./12,000 ft. (3 700 m)						
Output (overload)						

The engine is direct coupled to a 110-volt A.C. alternator and it also drives a 29-volt D.C. electric generator through a step-up gear, ratio 1:1.23. The unit is mounted horizontally in a fireproof and soundproof enclosure. Cooling is by means of a multivane centrifugal fan and ducts with haffles around the cylinders. Starting is by means of an electric starter, with emergency hand crank. The engine speed is regulated by a centrifugal-type governor connected to the carburetor. The voltages are controlled by automatic voltage regulators to suit the circuits on the airplane. The unit is fully automatic in operation.

JET PROPULSION

Among the new types of aircraft power plants which are now beginning to make their appearance, jet propulsion engines are attracting considerable attention. Fundamentally, jet engines utilize the reaction thrust resulting from the ejection of gases at high velocity for the propulsion of the aircraft in which they are installed. There are two basic types of jet engines:

- The atmospheric-type jet engine which depends upon the surrounding atmosphere for the oxygen required for the combustion of its fuel.
- The rocket-type jet engine which functions independently of the atmosphere by carrying its own oxygen supply for the combustion of its fuel.

The cyclic functioning and reaction thrust in these engines may be continuous (as in the gas turbine jet engine and the rocket jet engine), or intermittent (as in the impulse jet engine used in robot flying bombs).



BRITISH R.A.F. GLOSTER 1-JET FIGHTER

The first flight with an atmospheric-type jet engine was made in August, 1940, when an Italian Caproni-Campini CC-2 jet-propelled airplane remained in the air for 10 minutes. The Campini jet engine differed from present-day practice in that a 400 h.p. air-cooled radial aircraft engine was used to drive the compressor.

The first atmospheric-type jet engine embodying a turbine operated by combustion gases for driving the compressor, as is now common practice, was invented by Air Commodore Frank Whittle, R.A.F., in England. He was associated with Power Jets Limited. The British Thomson-Houston Company Ltd. built the first experimental Whittle jet engine in 1936, and it ran successfully on the test bed in 1937. It was first flown in May, 1941, in a Gloster E28/39 experimental 1-jet fighter built for the Royal Air Force. British jet-propelled fighters are now in service, one of the latest being the Gloster Meteor powered with 2 Rolls-Royce jet engines embodying basic Whittle designs.

The first atmospheric-type jet engine built in the United States was of Whittle design. In 1941, arrangements were made for a Whittle jet engine to be supplied to the General Electric Company (U.S.A.) and a year later G-E jet engines were in production here. General Electric jet engines were used in the Bell P-59A Airacomet 2-jet fighter built for the U.S. Army Air Forces when it made its initial flight in October,



COURTESY U.S. AIR FORCES

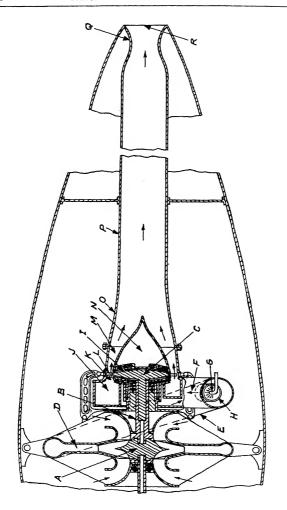
UNITED STATES A.A.F. BELL 2-JET FIGHTER

1942. G-E jet engines of improved design and increased performance are used in the new A.A.F. Lockheed P-80 Shooting Star 1-jet fighter which is in mass production in the United States.

Atmospheric-type jet engines of German origin made their appearance in robot flying bombs in June, 1944, and in this instance the engines were of the impulse jet or intermittent reaction thrust variety. They were followed in the Summer of 1944 by full-size piloted aircraft such as the 2-jet Arado 234, the 2-jet Heinkel He 280 and the 2-jet Messerschmitt Me 262 Schwalbe (Swallow) fighter bombers equipped with gas turbine jet engines of B.M.W. or Junkers design.

Rocket-type jet engines are used by the Germans in their 1-jet Messerschmitt Me 163 Komet (Comet) flying wing interceptors. These rocket planes display phenomenal bursts of speed but their supply of fuel and oxygen is limited and consequently their flight duration is very short and they have to glide during most of their time in the air. The Germans use rocket-type jet engines burning a mixture of liquid air and oxygen or alcohol in their V-2 long-range rocket bombs.





Whittle Jet Propulsion Engine

Country: Great Britain.

The Whittle jet propulsion engine consists of four main components—a centrifugal compressor, a combustion chamber, a gas turbine for driving the compressor, and a tail tube with an exhaust nozzle. A sectional view of one form of this jet engine is shown on the opposite page. The compressor is of the double entry type with two intakes—one on each side of the impeller A. The impeller is mounted on the same shaft B as the turbine rotor C and it is driven at high speed by the latter so that a high mass-flow of air is obtained with the air leaving the tips of the impeller blades at super-sonic velocity. Subsequently, the air speed is reduced to sub-sonic velocity by passing it through a primary diffuser chamber D and a delivery scroll E of increasing cross-section area.

The combustion chamber F into which the air passes from the delivery scroll is in the form of a relatively large helix with tapered ends of smaller cross-section area than the center portion. Low grade fuel such as kerosene is injected into the center portion through a nozzle G surrounded by a tubular cowl H with an inner wall of perforated metal or wire mesh which reduces the speed of the air adjacent to the nozzle and ensures continuous combustion. Only a small portion of the air is used for combustion and the remainder mingles with the combustion gases so that it is highly heated as well as moving at high velocity at constant pressure when it leaves the combustion chamber.

The turbine I is of the single-stage type with an annular intake chamber J and a single nozzle K extending almost completely around the periphery so that the rotor blades L are in the gas blast at all times. The turbine exhausts into a divergent channel M located between the cone N on the turbine casing and the discharge conduit O. In passing through the turbine, the highly heated air and gases give up a portion of their energy to drive the turbine and the compressor.

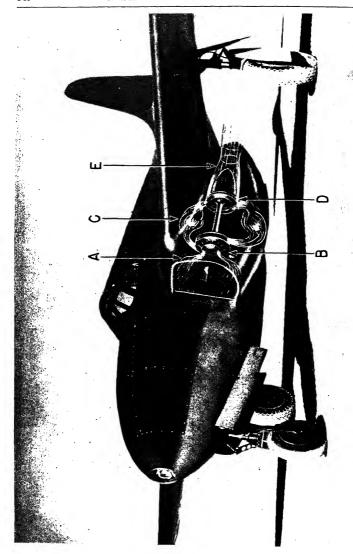
The tail tube P connected to the discharge conduit has a venturishaped throat Q which gives final impetus to the highly heated air and gases rushing at high velocity through the exhaust nozzle R into the atmosphere at the rear of the fuselage or engine nacelle.

The accessories such as the fuel injection pump and the lubricating oil pump are mounted on the compressor cover where they are driven through reduction gears. Control of the gas blast and the reaction thrust is accomplished by varying the quantity of fuel injected which in turn affects the speed of the turbine and the compressor.

Jet propulsion engines of basic Whittle design are now manufactured by several firms in England including the British Thomson-Houston Company Ltd., the De Havilland Aircraft Company Ltd., and Rolls-Royce Limited.

 $^{^1}$ The speed of sound is 1,126 ft./sec. (343 m/sec), or 768 m.p.h. (1 236 km/h) at 68° F. (20° C) at sea level.





General Electric Jet Propulsion Engine

Country: United States of America.

The General Electric jet propulsion engine now in production is similar to the Whittle jet engine developed in England. An installation of two G-E jet engines in a Bell Airacomet P-59A 2-jet fighter of the Army Air Forces is shown on the opposite page. In the diagramatic view of one of the engines, A is the air intake, B is the air compressor, C is the combustion chamber, D is the gas turbine, E is the tail tube.

The engine is started by means of an electric motor mounted in front of the compressor which rotates the latter's impeller until sufficient pressure is attained. When the power plant has been accelerated to starting speed, fuel is injected into the combustion chamber, where it is ignited by an electric spark. As soon as combustion is initiated, the starting motor and ignition system are shut off, and the heated air and combustion gases run the turbine, and with it, the compressor. Full thrust is available in a matter of seconds after combustion has commenced. The engine runs on kerosene and, when properly regulated, no visible flames come out of the tail pipe.

Heating of the air-flow from the compressor is obtained by passing the air through combustion chambers. Fuel ignition by spark plugs is required only during starting. Once started, combustion in each of the chambers is maintained by a continuous flow of fuel and air.

The lubrication system is quite simple, as it is only necessary to ensure that the impeller-turbine rotor shaft bearings and the accessory drive gears are properly lubricated. Forced-feed lubrication is used, and the excess lubricating oil is returned by a small scavenging pump and passed through a cleaning filter. Standard light engine oils are used as lubricants.

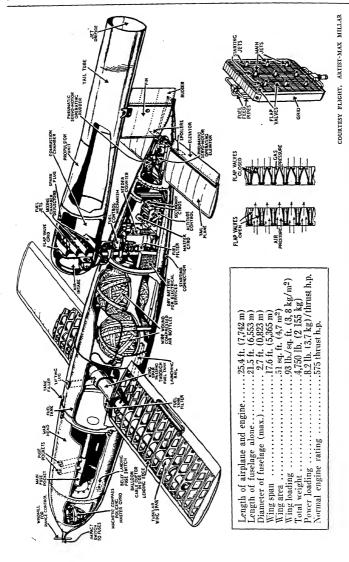
Removal of the engine from the airplane is a simple matter. Only a few connections have to be broken—the fuel line, the lubricating oil lines, the tachometer and electric generator lines, the starter lines, and the thermocouple leads to the tail tube and the main impeller-turbine rotor shaft bearing.

When in flight, the speed of the engine at various altitudes is maintained constant by means of altitude-compensating fuel controls, as the speed of the unit depends upon the amount of fuel it receives and the temperature and density of the air entering the compressor. The pilot can check the functioning of the jet engine by comparing the tail tube temperature against the r.p.m., just as he would check the manifold pressure against the r.p.m. of a reciprocating-type engine.

The GE jet propulsion engine functions powerfully and smoothly at extremely high altitudes. Fighting planes equipped with it have top

speeds approaching the speed of sound.

The latest G-E jet engine used in the new Lockheed P-80 Shooting Star 1-jet fighter of the U.S. Army Air Forces has an estimated output of approximately double that of the earlier engine used in the Bell Airacomet P-59A fighter.



V-1 Jet Propulsion Engine on German Robot Flying Bomb

V-1 Jet Propulsion Engine

Country Germany.

ModelV-1 (Vergeltungswaffe 1).

Type Atmospheric type, intermittent reaction thrust.

Construction Tubular welded sheet steel combustion chamber and tail tube. Air intake grille with 126 non-return flap valves each equipped with 2 flexible steel flaps. 4 horizontal aerofoil type deflectors behind grille to direct air flow close to fuel

injection nozzles to aid combustion.

Air compressor None. Ram effect in flight compresses air to more than at-

mospheric pressure.

Gas turbineNone.

Injection Direct fuel injection through 9 nozzles or atomizers in 3 horizontal rows behind air intake grille. Fuel injection pres-

normal rows behind air intake grine. Fuel injection pressure of 100 lb./sq.in. (7,0 kg/cm²) obtained from compressed air bottles with reduction valves in airplane fuselage. Automatic fuel control regulated by air pressure in pitot

tube on airplane when in flight.

IgnitionResidual flame of combustion of previous charge.

the 3 upper tuel nozzles through which tuel is also injected into combustion chamber. Mixture is ignited by spark plug in combustion chamber and cyclic functioning commences.

Cyclic functioningl. Intake: Air passes through intake valves in grille into combustion chamber.

Compression: Air is compressed by ram effect, and fuel is injected and ignited by residual flame of combustion of previous charge.

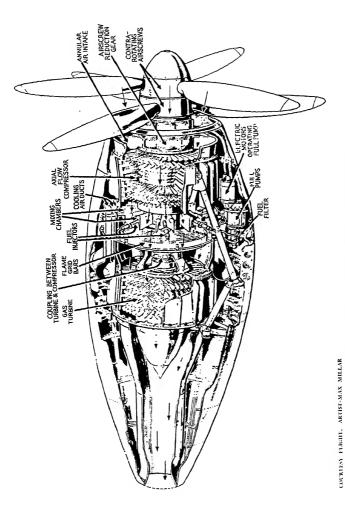
3. Combustion and expansion: Fuel burns and gas pressure created in combustion chamber closes flaps on air intake valves.

4. Reaction thrust and exhaust: Gas pressure imparts forward reaction thrust to engine unit while burnt gases leave combustion chamber through tail tube. Pressure inside combustion chamber drops below atmospheric permitting flaps on air intake valves to open admitting air for succeeding cycle of operation.

Diameter (max.)	584 mm
Length	3 430 mm
Frontal area	$0.27 m^2$
Weight (approx.)250 lb.	113 kg
Weight/thrust h.p 0.43 lb./t.h.p.	0,19 kg/thp
Fuel consumption4.51 lb./t.h.p./hr.	2,04 kg/thp/hr
Fuel grade	73 octane gasoline
Impulse frequency/sec	45 i/s
M.e.p. thrust	$42,1 \text{ kg/cm}^2$
Rating (normal) 1575 t.h.p./45 i.p.s./	2,000 ft. (900 m)

Note: The above figures are based on the assumption that this jet engine is installed on the robot flying bomb illustrated on the opposite page, flying at a normal speed of 360 m.p.h. (580 km/h) at an altitude of 2,000 ft. (900 m) and with a fuel consumption of 0.833 U.S. gal. (1 Imp. gal. or 4,55 lit) per mile.

1575 thrust h.p. from this jet engine is equivalent to approximately 725 brake h.p. from a reciprocating type aircraft engine and propeller.



Gas Turbine - Jet Propulsion Power Plant

The Gas Turbine

Country: Great Britain.

Although a gas turbine and an air compressor are considered essential components for producing thermal energy for jet propulsion, these two components can also be used together for producing mechanical energy for driving a conventional propeller. In the case of jet propulsion, the compressor is of paramount importance and the turbine is merely the means for driving the compressor so that the latter will produce the high mass-flow of air required for reaction propulsion. When the turbine's chief function becomes that of driving a propeller, however, the relative importance of the two components is reversed. The turbine then becomes of paramount importance and the compressor's function becomes that of a supercharger to supply the air needed for combustion and production of gases to drive the turbine. Full use is then made of the mechanical thrust produced and the thermal thrust of the exhaust is merely incidental, as in the case of a conventional reciprocating type engine with ejector type exhaust stacks.

A cut-away view of a gas turbine unit proposed by G. Geoffrey Smith, M.B.E., in England, is shown on the opposite page. The turbine is of the multi-stage type and the axial flow compressor is placed in front of it for aerodynamic reasons. The drive shaft connecting the rotor of the turbine and the impeller of the compressor extends forward and drives the two concentric propeller shafts for the two contra-rotating propellers through planetary spur reduction gears. The exhaust from the turbine is directed straight back so that it creates a jet propulsion effect.

In operation, air enters the compressor through an annular intake around the front of the unit. After being compressed, the air passes from the last stage of the compressor directly into the mixing chambers into which the fuel is injected. There the mixture ignites and the combustion gases rush back through the concentric flame grid bars which ensure even combustion, into the turbine. In the turbine, most of the energy of the combustion gases is absorbed to drive the rotor and with it, the propellers and the compressor. The exhaust gases from the turbine pass through a tail tube and a venturi-shaped nozzle into the atmosphere and the forward reaction thrust thus produced provides additional propulsive power.

This type of power plant in which propeller propulsion is combined with jet propulsion with a gas turbine providing the motive power, should have a definite future in aviation. At take-off and at low speeds when the airplane is climbing, the jet propulsion effect would not be appreciable due to the low air velocity at the air intakes and the low mass air flow from the compressor or supercharger. The propellers would be operating at high efficiency under these conditions, however, and they would take up the load. When the speed of the airplane increased after its operational altitude had been attained, the increased air velocity at the compressor intakes would enable a substantial jet propulsion effect to be utilized from the turbine exhaust.

United States of America

Make	Model	Туре	Displac Cu. in.		T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
*Allison	V-1710-E11	12-V2-L-G-SV2	1710	28,0	1325	1150/22,400 ft. (6 800 m)	100/130
*Allison	V-1710-E19	12-V2-L-G-S1	1710	28,0	1200	1125/15,500 ft. (4 700 m)	100/130
*Allison	V-1710-F17	12-V2-L-G-S1T	1710	28,0	1425	1425/27,000 ft. (8 200 m)	100/130
*Allison	V-1710-F30	12-V2-L-G-S1T	1710	28,0	1475	1475/30,000 ft. (9 100 m)	100/136
*Allison	V-3420-A16	24-V4-L-G-S1T	3420	56,0	2600	2600/25,000 ft. (7 600 m)	100/130
*Continental	A-65-8	4-02-A-D-NS	171	2,8	65	65/sea level	73
*Continental	C-75-12	4-02-A-D-NS	188	3,1	75	75/sea level	73
*Continental	C-140-1	6-02-A-G-NS	282	4,6	140	140/sea level	73
Continental	I-1430	12-∧2-L-G-S1T	1425	23,3	2100	NA	100/130
*Continental	W-670-M	7-R1-A-D-NS	668	10,9	240	240/sca level	80
*Franklin	4AC-176-BA2	4-02-A-D-NS	176	2,9	65	65/sea level	73
*Franklin	6AC-298-H3	4-02-A-G-NS	298	4.9	160	160/sea level	80
*Franklin	6ACV-298	6-02-A-D-NS	298	4.9	160	160/sea level	. 80
*Franklin	6ACV-403	6-02-A-D-NS	403	6,6	245	245/sea level	80
*General Motors	X-250-D	8-X4-L-D-GB	250	4,1	200	200/sea level	91/96
*Guiberson	A-1020	9-R1-A-D-NS	1021	16.7	310	310/sea level	DF
*Jacobs	R-755	7-R1-A-D-NS	757	12,4	245	225/sea level	73
*Jacobs	R-915	7-R1-A-D-NS	914	15.0	330	300/sea level	80
*Kinner	B-54	5-R1-A-D-NS	441	7,2	125	125/sea level	73
	K-52	5-R1-A-D-NS	372	6,1	100	100/sea level	73
*Kinner *Kinner	R-56	5-R1-A-D-NS	540	8,8	160	160/sea level	73
	GO-145-C4	4-02-A-G-NS	144	2,4	75	75/sea level	73
*Lycoming	0-235-B	4-02-A-D-NS	233	3,8	100	100/sea level	73
*Lycoming	0-235-B 0-290-C	4-02-A-D-NS	289	4,7	130	125/sea level	73
*Lycoming	GO-435-B	4-02-A-G-NS	434	7,5	220	220/sea level	91/96
*lycoming			434	7,5	212	212/sea level	100/130
*Lycoming	0-435-D	4-02-A-D-NS	680		300	285/sea level	
*Lycoming	R-680-E3	9-R1-A-D-GB		11,1			87
*Packard	V-1650-1	12-V2-L-G-S2	1649	27,0 $27,0$	1300 1380	1120/18,500 ft. (5 600 m)	100/130
*Packard	V-1650-3	12-V2-L-G-S22	1649			1210/25,800 ft. (7 900 m)	100/130
*Packard	V-1650-7	12-V2-L-G-S22	1649	27,0	1490	1370/21,400 ft. (6 500 m)	100/130
*Pratt & Whitney	R-985 SB3	9-R1-A-D-S1	985	16,1	450	450/3,500 ft. (1 100 m)	91/96
Pratt & Whitney	R-1340 S3H1-G	9-R1-A-G-S1	1344	22,0	600	600/3,000 ft. (900 m)	91/96
*Pratt & Whitney	R-1830 S3C4-G	14-R2-A-G-S2	1830	30,0	1200	1050/13,100 ft. (4 000 m)	100/130
*Pratt & Whitney	R-1830 SSC7-G	14-R2-A-G-S22	1830	30,0	1200	1100/17,500 ft. (5 300 m)	100/130
Pratt & Whitney	R-2000 2SD-G	14-R2-A-G-S2	2000	32,7	1450	1100/16,000 ft. (4 900 m)	100/130
*Pratt & Whitney	R-2800 2SB-G	18-R2-A-G-S2	2804	45,9	2000	1600/13,500 ft. (4 100 m)	100/130
*Pratt & Whitney	R-2800 SSB2-G	18-R2-A-G-S22	2804	45,9	2000	1650/22,500 ft. (6 800 m)	100/130
*Ranger	6-440C-5	6-L1-A-D-NS	441	7,2	200	200/sea level	87
#Rauger	SGV-770C-1B	12-∧2-A-G-S1	773	12,7	52 0	520/12,000 ft. (3 700 m)	91/96
*Runger	SGV-770D-5	12-∧2-A-G-S1	773	12,7	700	600/8,000 ft. (2 400 m)	100/130
*Warner	Scarab 50	7-R1-A-D-NS	422	6,9	131	125/sea level	73
*Warner	Super Scarab 165	7-R1-A-D-NS	499	8,2	175	165/sea level	73
*Warner	Super Scarab 185	7-R1-A-D-NS	555	9,1	200	180/sea level	73
*White	R-275S	5-R1-A-D-NS	266	4,3	115	115/sea level	80
*Wright	R-760 E2	7-R1-A-D-GB	756	12,4	350	320/sea level	91/96
*Wright	R-975-E3	9-R1-A-D-S1	973	15,9	450	420/1,400 ft. (400 m)	91/96
*Wright	R-1300 C7BA1	7-R1-A-G-S2	1300	21,3	700	500/17,000 ft. (5 200 m)	91/96
*Wright	R-1820 C9GC	9-R1-A-G-S2	1823	29,9	1200	900/15,200 ft. (4 600 m)	91/96
*Wright	R-1820 C9HC	9-R1-A-G-S2	1823	29,9	1350	1000/17,500 ft. (5 300 m)	100/130
*Wright	R-2600 C14BB	14-R2-A-G-S2	2603	42,7	1900	1450/15,000 ft. (4 600 m)	100/130
*Wright	R-3350 C18BA2	18-R2-A-G-S2	3347	54,9	2200	1800/14,000 ft. (4 300 m)	100/130

Abbreviations Used in Tabulations

A = Air cooled. D = Direct drive. DF = Diesel fuel. G = Geared drive. GB = Ground blower (gear driven). H4 = H eylinder arrangement (4 banks vertical). L = Liquid cooled. L1 = In-line cylinder arrangement (1 bank). NA = Not available. NS = Not supercharged. O2 = Opposed cylinder arrangement (2 banks horizontal). O4 = Opposed cylinder arrangement (2 banks horizontal). O4 = Opposed cylinder arrangement (2 banks horizontal). R1 = Radial cylinder arrangement (1 row). R2 = Radial cylinder arrangement (2 rows). R7 = Radial cylinder arrangement (2 rows). R3 = Supercharged (gear-driven 1-speed 1-stage). S2 = Supercharged (gear-driven 1-speed 1-stage). S2 = Supercharged (gear-driven 1-speed 1-stage). S2 = Supercharged (gear-driven 1-speed 1-stage). S1T = Supercharged (gear-driven 1-speed 1-stage). SV2 = Supercharged (gear-driven 1-speed 1-stage). SV3 = Supercharged (gear-driven 1-speed 1-stage). SV4 = Supercharged (gear-driven 1-speed 1-stage). SV5 = Supercharged (gear-driven 1-speed 1-stage). SV6 = Supercharged (gear-driven 1-speed 1-stage). SV7 = Supercharged (gear-driven 1-speed 1-stage). SV8 = Supercharged (gear-driven 1-speed 1-stag

^{*}This engine is illustrated and described in complete detail in the standardized data section of this book.

Great Britain

			Dionio	cement	T.O.	Rated H.P.	Fuel
Make	Model	Type		Liters	H.P.	and Rated Altitude	Grade
*Alvis	Leonides	9-R1-A-D-S1	719	11,8	450	435/8,250 ft. (2 500 m)	87
*Armstrong Siddeley	Cheetah XV	7-R1-A-G-S1	835	13.7	420	400/4,000 ft. (1 200 m)	87
*Armstrong Siddeley	Tiger VIII	14-R2-A-G-S2	1996	32.7	920	780/14,250 ft. (4 300 m)	87
Bristol	Mercury XV, 25	9-R1-A-G-S1	1520	24.9	725	840/14,000 ft. (4 300 m)	87
*Bristol	Mercury XV, 25	9-R1-A-G-S1	1520	24.9	905	995/9,250 ft. (2 800 m)	100/130
Bristol	Mercury XX	9-R1-A-G-S1	1520	24.9	820	870/4,500 ft. (1 400 m)	87
Bristol	Mercury 30	9-R1-A-G-S1	1520	24.9	950	995/18,000 ft, (5 500 m)	100/130
Bristol	Pegasus XVIII	9-R1-A-G-S2	1753	28,7	965	885/15,500 ft. (4 700 m)	87
*Bristol	Pegasus XVIII	9-R1-A-G-S2	1753	28.7	1050	965/13,000 ft, (4 000 m)	100/130
*Bristol	Perseus XVI	9-R1-A-G-S1	1520	24.9	905	955/5,000 ft. (1 500 m)	87
*Bristol	Taurus XII	14-R2-A-G-S1	1550	25,4	1085	1130/3,500 ft, (1 100 m)	100/130
Bristol	Hercules XI	14-R2-A-G-S2	2360	38,7	1560	1460/9,500 ft. (2 900 m)	100/130
*Bristol	Hercules XVI	14-R2-A-G-S2	2360	38,7	1615	1455/12.000 ft. (3 700 m)	100/130
Bristol	Hercules XVII	14-R2-A-G-S1	2360	38.7	1725	1735/500 ft. (150 m)	100/130
Bristol	Hercules XVIII	14-R2-A-G-S2	2360	38,7	1725	1565/8,000 ft. (2 400 m)	100/130
Bristol	Centaurus	18-R2-A-G-S2	3270	53,6	2000	NA	100/130
*Cirrus	Minor I	4-L1-A-D-NS	220	3,6	90	82/sea level	73
*Cirrus	Minor II	4-L1-A-D-NS	243	4,0	100	90/sea level	73
*Cirrus	Major I	4-L1-A-D-NS	386	6,3	150	138/sea level	73
†De Havilland	Gipsy Minor	4-L1-A-D-NS	229	3.8	90	80/sea level	73
*De Havilland	Gipsy Major I	4-L1-A-D-NS	374	6,1	130	120/sea level	73
*De Havilland	Gipsy Six II	6-L1-A-D-NS	560	9,2	210	185/sea level	80
*De Havilland	Gipsy Six IIIS	6-L1-A-D-S1	622	10.2	285	265/7,000 ft. (2 100 m)	87
†De Havilland	Gipsy Twelve	12-∧2-A-G-S1	1121	18,4	525	425/7,500 ft. (2 300 m)	87
*Napier	Dagger VIII	24-H4-A-G-S1	1027	16.8	955	1000/8,750 ft. (2 700 m)	87
*Napier	Sabre IIA	24-O4-L-G-S2	2240	36,7	2200	NA	100/130
Napier	Sabre IIB	24-O4-L-G-S2	2240	36,7	2400	NA	100/130
*Rolls-Royce	Peregrine I	12-V2-L-G-S1	1296	21,2	765	960/12,000 ft. (3 700 m)	100/130
*Rolls-Royce	Vulture I	24-X4-L-G-S2	2592	42,4	2010	1710/15,000 ft. (4 600 m)	100/130
Rolls-Royce	Merlin X	12-V2-L-G-S2	1649	27.0	1075	1010/17,750 ft. (5 400 m)	87
*Rolls-Royce	Merlin XX	12-V2-L-G-S2	1649	27,0	1280	1480/12,500 ft. (3 800 m)	100/130
*Rolls-Royce	Merlin 45	12-V2-L-G-S1	1649	27,0	1185	1515/11,000 ft. (3 400 m)	100/130
*Rolls-Royce	Merlin 61	12-V2-L-G-S22	1649	27,0	1290	1390/23,500 ft. (7 200 m)	100/130
*Rolls-Royce	Merlin 63, 63A	12-V2-L-G-S22	1649	27,0	1650	NA	100/130
Rolls-Royce	Merlin 72, 73	12-V2-L-G-S22	1649	27,0	1750	NA	100/130
*Rolls-Royce	Griffon IV	12-V2-L-G-S2	2240	36,7	1750	NA	100/130
*Rolls-Royce	Griffon 65	12-V2-L-G-S22	2240	36,7	2000	NA	100/130

France

Make	Model	Туре		cement . Liters		Rated H.P. and Rated Altitude	Fuel Grade
Béarn	6ID	6-L1-A-G-S1	653	10,7	375	350/6,500 ft. (2 000 m)	87
*Gnone-Rhone	14M-8	14-R2-A-G-S1	1159	19,0	750	680/7,000 ft. (2 100 m)	87
*Gnome-Rhone	14N-48	14-R2-A-G-S1	2360	38,7	1180	1060/12,800 ft. (3 900 m)	87
Gnome-Rhone	14 N-50	14-R2-A-G-S2	2360	38,7	1400	1200/13,100 ft. (4 000 m)	92
*(Inome-Rhone	14R-4	14-R2-A-G-S2	2360	38,7	1590	1580/18,000 ft. (5 500 m)	92
*Chome-Rhone	18R-1	18-R2-A-G-S2	3034	49,7	2200	2150/22,300 ft. (6 800 m)	92
Hispano-Suiza	14A A	14-R2-A-D-S1	2758	45,2	1080	1150/13,100 ft. (4 000 m)	87
Hispano-Suiza	14AB	14-R2-A-D-S1	1593	26,1	700	750/13,100 ft. (4 000 m)	87
Hispano-Suiza	12X-12	12-V2-L-G-S1	1648	27,0	740	690/12,800 ft. (3 900 m)	87
*Histano-Suiza	12Y-50	12-V2-L-G-S1	2197	36,0	1100	1000/10,800 ft. (3 300 m)	87
*Hispano-Suiza	12%	12-V2-L-G-S1	2197	36,0	1300	1200/13,100 ft. (4 000 m)	92
Hispano-Suiza	24Y-90	24-H4-L-G-S1	4394	72,0	2200	2000/10,800 ft. (3 300 m)	87
Mathis	4213	42-R7-L-G-S2	3910	64,1	2800	NA	92
*Renault	4 P-ci	4-L1-A-D-NS	384	6,3	150	140/sea level	80
*Renault	6Q-04	6-L1-A-D-S1	580	9,5	240	220/14,100 ft. (4 300 m)	80
*Repault	12R-00	12-∧2-A-D-S1	1159	19,0	500	450/13,100 ft. (4 000 m)	87

^{*}This engine is illustrated and described in complete detail in the standardized data section of this book, \dagger This engine is not active, January, 1945.

Australia

Make	Model	Туре	Displacer Cu. in. l		T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
*Commonwealth Aircraft *Commonwealth Aircraft *General Motors-Holdens	R-1340 S1H1-G R-1830 S1C3-G Gipsy Major I	9-R1-A-G-S1 14-R2-A-G-S1 4-LI-A-D-NS	1830 3	22,0 6,0 6,1	1200	550/5,000 ft. (1 500 m) 1200/3,700 ft. (1 100 m) 122/sea level	91/96 91/96 73

Germany

			Displac		т.о.	Rated H.P.	Fuel
Make	Model	Туре	Cu. in.	Liters	H.P.	and Rated Altitude	Grade
*Argus	As 10-C3	8-A2-A-D-NS	775	12,7	240	220/sea level	80
*Argus	As 410-A1	12-∧2-A-G-S1	732	12,0	450	360/9,800 ft. (3 000 m)	87
Argus	As 411	12-∧2-A-G-S1	732	12,0	500	450/13,100 ft. (4 000 m)	92
*B.M.W.	132-K	9-R1-A-G-S1	1690	27,7	1000	960/9,800 ft. (3 000 m)	87
*B.M.W.	801-D1	14-R2-A-G-S2	2550	41,8	1700	1600/19,800 ft. (6 000 m)	92
B.M.W.	802	18-R2-A-G-S2	3289	53,6	2000	2200/18,000 ft. (5 500 m)	92
Bramo	Sh 14A-4	7-R1-A-D-NS	470	7,7	160	145/sca level	80
*Bramo	Fafnir 323P-1	9-R1-A-G-S2	1636	26,8	985	775/13,900 ft. (4 200 m)	87
*Daimler-Benz	DB 601-E	12-∧2-L-G-SV1	2069	33,9	1375	1375/18,000 ft. (5 500 m)	92
Daimler-Benz	DB 601-F1	12-A2-L-G-SV1	2069	33,9	1395	1400/19,700 ft. (6 000 m)	92
Daimler-Benz	DB 601-N	12-∧2-L-G-SV1	2069	33,9	1200	1270/16,400 ft. (5 000 m)	92
*Daimler-Benz	DB 603-A	12-A2-L-G-SV1	2720	44,5	1800	1680/18,000 ft. (5 500 m)	92
*Daimler-Benz	DB 605-A1	12-∧2-L-G-SV1	2180	35,7	1500	1350/19,700 ft. (6 000 m)	92
Daimler-Benz	DB 606	24-A4-L-G-SV1	4138	67.8	2400	2400/16,400 ft. (5 000 m)	92
Daimler-Benz	DB 610	24-A4-L-G-SV1	4360	71.4	2700	2600/19,000 ft. (5 800 m)	92
Hirth	HM 60-R2	4-L1-A-D-NS	220	3.6	80	72/sea level	73
*Hirth	HM 504-A2	4-L1-A-D-NS	238	4.0	105	95/sea level	80
*Hirth	HM 506-A1	6-L1-A-D-NS	360	5,9	160	145/sea level	80
*Hirth	HM 508-D	8-A2-A-G-S1	482	8,0	280	260/1,600 ft. (500 m)	80
*Hirth	HM 512-B	12-∧2-A-G-S1	732	12,0	450	360/9,800 ft. (3 000 m)	87
Hirth	HM 515	4-L1-A-D-NS	177	3.0	65	60/sea level	80
*Junkers	Jumo 205-Ea	12-L1-L-G-S1	1014	16.6	700	650/8,200 ft. (2 500 m)	DF
*Junkers	Jumo 206	12-L1-L-G-S1	1556	25.5	1200	1000/9,800 ft. (3 000 m)	DF
*Junkers	Jumo 207-A	12-L1-L-G-S1T	1014	16.6	1000	1000/32,800 ft. (10 000 m)	DF
Junkers	Jumo 208	12-L1-L-G-S1T	1556	25.5	1500	1500/28,000 ft. (8 000 m)	DF
Junkers	Jumo 210-G	12-A2-L-G-S2	1202	19,7	700	675/12,500 ft. (3 800 m)	87
*Junkers	Jumo 211-J	12-A2-L-G-S2	2136	35.0	1350	1260/16,400 ft. (5 000 m)	92
*Junkers	Jumo 213-A	12-A2-L-G-S2	2250	36.9	1700	1500/19,800 ft. (6 000 m)	92
Zündapp	Z 909-2AO	4-L1-A-D-NS	122	2.0	55	50/sea level	73

Italy

Make	Model	Туре	Displac Cu. in.	ement Liters	T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
*Alfa Romeo	Alfa 110-1	4-L1-A-D-NS	374	6.1	130	120/sea level	73
*Alfa Romeo	Alfa 115-1	6-L1-A-D-NS	560	9.2	205	195/sea level	73
Alfa Romeo	Alfa 126-RC34	9-R1-A-G-S1	1746	28.6	780	780/11,500 ft. (3 500 m)	87
*Alfa Romeo	Alfa 128-RC21	9-R1-A-G-S1	1746	28.6	950	860/6,900 ft. (2 100 m)	87
*Alfa Romeo	Alfa 135-RC32	14-R2-A-G-S1	2940	48,2	1620	1400/10,500 ft. (3 200 m)	87
C.N.A.	D-4	4-02-A-D-NS	183	3.0	60	60/sea level	73
*Fiat	A74-RC38	14-R2-A-G-S1	1904	31,2	890	840/12,500 ft. (3 800 m)	87
*Fiat	A80-RC41	18-R2-A-G-S1	2789	45,7	1030	1000/13,500 ft. (4 100 m)	87
*Fiat	A82-RC42	18-R2-A-G-S1	2873	47.1	1400	1250 13,800 ft. (4 200 m)	87
*Isotta Fraschini	Beta	6-L1-A-G-S1	586	9.6	300	270 4,600 ft, (1 400 m)	87
Isotta Fraschini	Gamma RC35-IDS	12-∧2-A-G-S1	1171	19.2	550	580/13,100 ft. (4 000 m)	87
*Isotta Fraschini	Delta RC35-IDS	12-A2-A-G-S1	1630	26.7	770	750/13,100 ft. (4 000 m)	87
*Piaggio	P.VII-C35	7-R1-A-D-S1	1177	19.3	500	460/11,500 ft. (3 500 m)	87
*Piaggio	P.X-RC35	9-R1-A-G-S1	1519	24.9	650	625 (11,500 ft. (3 500 m)	87
*Piaggio	P.XI-RC40	14-R2-A-G-S1	2356	38.6	1000	1000/13,100 ft, (4 000 m)	87
*Piaggio	P.XII-RC35	18-R2-A-G-S1	3234	53.0	1500	1350/11,500 ft. (3 500 m)	87
Piaggio	P.XVI-RC35	9-R1-A-G-S1	1519	24.9	700	670/11,500 ft. (3 500 m)	87
Piaggio	P.XXII-RC35D	18-R2-A-G-S1	3691	60,5	1700	1600/11,500 ft. (3 500 m)	87

^{*}This engine is illustrated and described in complete detail in the standardized data section of this book,

Japan

	Bradal	7		ement		Rated H.P.	Fuel
Make	Model	Туре	Cu. in	. Liters	H.P.	and Rated Altitude	Grade
*Aichi	Atsuta 21	12-A2-L-G-SV1	2069	33,9	1200	1100/13,500 ft. (4 100 m)	92
Hitachi	Amakaze 11	9-R1-A-D-NS	1090	17,9	340	300/sea level	80
Hitachi	Hatsukaze	5-R1-A-D-NS	372	6,1	100	90/sea level	73
Hitachi	Kamikaze	7-R1-A-D-NS	530	8,7	140	130/sea level	80
Kawasaki	Type 2	12-∧2-L-G-SV1	2069	33,9	1200	1100/13,500 ft. (4 100 m)	92
Mitsubishi	Kasei 11, 15	14-R2-A-G-S2	2570	42,1	1500	1350/13,100 ft. (4 000 m)	92
Mitsubishi	Kasei 21, 22, 25	14-R2-A-G-S2	2570	42,1	1800	1500/16,400 ft. (5 000 m)	92
Mitsubishi	Kinsei 43	14-R2-A-G-S1	1971	32,3	1050	1060/6,600 ft, (2 000 m)	87
*Mitsubishi	Kinsei 44	14-R2-A-G-S1	1971	32,3	1000	1075/13,100 ft. (4 000 m)	92
Mitsubishi	Kinsei 45, 46	14-R2-A-G-S1	1971	32,3	1000	1050/14,100 ft. (4 300 m)	92
Mitsubishi	Miozio	9-R1-A-G-S1	1690	27,7	800	750/13,100 ft. (4 000 m)	87
Mitsubishi	Type 1	14-R2-A-G-S2	2570	42,1	1100	1100/10,000 ft. (3 000 m)	92
Mitsubishi	Zuisei 13	14-R2-A-G-S1	1709	28,0	850	860/13,100 ft. (4 000 m)	92
Nakajima	Hikari I	9-R1-A-G-S1	1820	29,9	800	800/13,100 ft. (4 000 m)	87
Nakajima	Hikari II	9-R1-A-G-S2	1820	29,9	1000	880/16,400 ft. (5 000 m)	92
Nakajima	Homare 11	18-R2-A-G-S2	2185	35,8	1800	1500/13,100 ft. (4 000 m)	92
Nakajima	Homare 21	18-R2-A-G-S2	2185	35,8	1800	1600/16,400 ft. (5 000 m)	92
Nakajima	Kotubuki II	9-R1-A-G-S1	1470	24,1	500	450/12,000 ft. (3 600 m)	87
Nakajima	Kotubuki III	9-R1-A-G-S1	1470	24,1	610	680/12,000 ft. (3 000 m)	87
Nakajima	Sakae 11	14-R2-A-G-S1	1700	27,8	980	950/10,000 ft. (3 000 m)	87
Nakajima	Sakae 12	14-R2-A-G-S1	1700	27,8	1000	900/13,100 ft. (4 000 m)	92
*Nakajima	Sakae 21, 22	14-R2-A-G-S2	1700	27,8	1150	950/19,700 ft. (6 000 m)	92
Nakajima	Type 1	14-R2-A-G-S1	1700	27,8	900	900/12,000 ft. (3 600 m)	87
Nakaijma	Type 2	14-R2-A-G-S2	2185	35,8	1400	1300/16,400 ft. (5 000 m)	92

U.S.S.R.

Make	Туре	Displa Cu. in.	cement Liters	T.O. H.P.	Rated H.P. and Rated Altitude	Fuel Grade
M-11	5-R1-A-D-NS	518	8,5	100	100/sea level	73
M-11G	5-R1-A-G-NS	518	8,5	130	130/sca level	73
M-15	9-R1-A-D-S1	1753	28,7	415	480/12.000 ft. (3 600 m)	87
M-17	12-V2-L-D-NS	2864	46,9	680	680/sea level	87
M-26	7-R1-A-D-GB	756	12,4	300	300/sea level	87
AM-35	12-V2-L-G-S2	2800	45.9	1200 *	1100/13,100 ft. (4 000 m)	87
AM-35A	12-V2-L-G-S2	2800	45,9	1350	1000/16,400 ft. (5 000 m)	95
*AM-38A	12-V2-L-G-S2	2800	45.9	1600	1400/19,700 ft. (6 000 m)	95
AM-38B	12-V2-L-G-S1	2800	45.9	1600	1500/6,600 ft. (2 000 m)	95
M-64	9-R1-A-G-S2	1823	29,9	1000	1000/13,100 ft. (4 000 m)	95
M-82	14-R2-A-G-S2	2603	42,7	1600	1300/13,100 ft. (4 000 m)	95
M-85	14-R2-A-G-S1	2360	38,7	1000	1000/13,100 ft. (4 000 m)	87
M-87B	14-R2-A-G-S2	2360	38,7	1100	1000/13,100 ft. (4 000 m)	95
*M-88	14-R2-A-G-S2	2360	38,7	1100	1000/13,100 ft. (4 000 m)	95
M-103	12-V2-L-G-S1	2197	36,0	1000	950/11,800 ft. (3 600 m)	95
*M-105P	12-V2-L-G-S2	2197	36,0	1100	1050/13,100 ft. (4 000 m)	95
M-105R	12-V2-L-G-S2	2197	36.0	1100	1050/13,100 ft. (4 000 m)	95
M-107	12-V2-L-G-S2	2197	36,0	1200	1100/16,400 ft. (5 000 m)	95

Airborne Auxiliary Power Plants

	UI	NIT	ENGI	NE	GENERATOR		
Country	Make	Model	Type	H.P.	Туре	Continuous Output	
tUnited States	Andover	V-32	2-V2-A-G-NS	10.0	Aircraft	5.0 kw. 28.5 v. D.C.	
United States	Eclipse	NEG-1	1-L1-A-D-NS	4.0	Eclipse	3.0 kw. 28.5 v. D.C., or 3.0 kw. 120 v. A.C.	
United States	Lawrance	30C-1	2-02-A-D-NS	10.0	Aircraft	5.0 kw. 28.5 v. D.C.	
United States	Lawrance	301)-1	2-02-A-D-NS	10.0	Aircraft	5.0 kw, 28.5 v. D.C.	
United States	Onan	1C-688	1-L1-A-D-NS	1.1	Onan	0.6 kw. 24.0 v. D.C.	
United States	Onan	OTC-80E	2-02-A-D-NS	4.0	Onan	2.0 kw. 28.5 v. D.C.	
United States	Onan	OFA-90	4-O2-A-G-NS	11.7	Aircraft	5.0 kw. 28.5 v. D.C.	
Great Britain	Rotol	P-6	6-O2-A-D-NS	60.0	Rotol	3.5 kw. 29.6 v. D.C. and 20.0 kw. 110 v. A.	

^{*}This engine is illustrated and described in complete detail in the standardized data section of this book.
†This unit is illustrated and described in complete detail in the Airborne Auxiliary Power Plants section of this book.

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